SOIL SURVEY OF

Shelby County, Indiana

Major fieldwork for this soil survey was done in the period 1960–67. Soil names and descriptions were approved in 1968. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1968. This survey was made cooperatively by the Soil Conservation Service and the Purdue University Agricultural Experiment Station. It is part of the technical assistance furnished to the Shelby County Soil and Water Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

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Contents

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SOIL SURVEY OF SHELBY COUNTY, INDIANA

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION

SHELBY COUNTY is in the southeastern part of central Indiana (fig. 1) and has an area of 409 square miles, or 261,760 acres. The county is rectangular and extends 24 miles from north to south and 17 miles from east to west. Shelbyville, the county seat and largest city, is located near the center of the county.

Farming is the leading occupation, with cash-grain and livestock the major types of farming. The major livestock program is hog and beef cattle feeding, but there are also several dairy farms.

Some of the land is being developed for nonfarm uses around Shelbyville and along Interstate 74 in the northwestern part of the county. The use of soils for farming is emphasized in this survey, but attention is also given to nonfarm uses.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Shelby County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes; the size and nature of streams; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey (*6*).[1]

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Brookston and Crosby, for example, are the names of two soil series. All the soils in the United States having the same series name

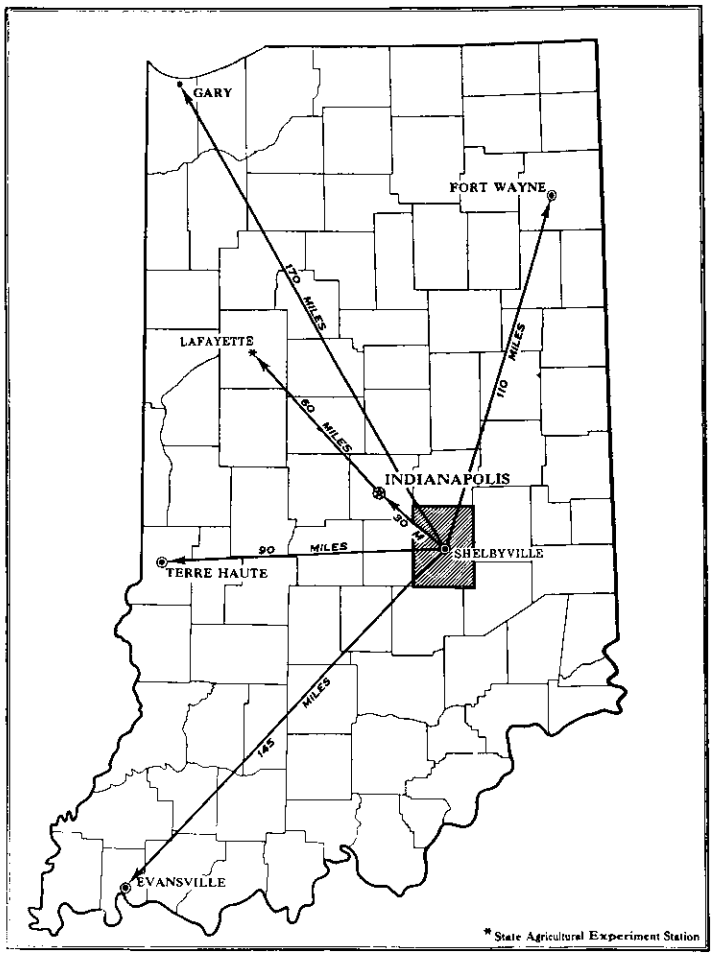

Figure 1.—Location of Shelby County in Indiana.

[1] Italicized numbers in parentheses refer to Literature Cited, page 91.

are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Miami silt loam, 2 to 6 percent slopes, eroded, is one of several phases within the Miami series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Two such kinds of mapping units shown on the soil map of Shelby County are soil complexes and undifferentiated groups.

A soil complex consists of areas of two or more soils, so intermingled or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Crosby-Miami silt loams, 0 to 6 percent slopes, is an example.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. The name of an undifferentiated group consists of the names of the dominant soils, joined by "and." Westland and Brookston loams, overwash, is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, or so severely eroded that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Gravel pits and Quarries are land types in Shelby County.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of users, among them farmers, managers of recreational areas, and engineers.

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. Then they adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Shelby County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in Shelby County are discussed in the following pages.

1. Crosby-Brookston association

Deep, somewhat poorly drained and very poorly drained, nearly level and gently sloping, medium-textured and moderately fine textured soils; on uplands

Soils in this association are in the uplands. The dark-colored Brookston soils are generally in slight depressions, and the somewhat lighter colored Crosby soils are at slightly higher elevations (fig. 2). This association makes up about 249 square miles, or 61 percent of the county. Crosby soils make up about 45 percent of the association; Brookston soils, about 30 percent; and minor soils, the remaining 25 percent. The farms generally exceed 160 acres in size, and some are more than 500 acres.

The nearly level and gently sloping Crosby soils are on low knolls and ridges. They are somewhat poorly drained and have a dark grayish-brown, medium-textured surface layer. The grayish-brown subsoil is moderately fine textured and is mottled. The underlying calcareous, medium-textured till is at a depth of 24 to 40 inches.

The Brookston soils occupy depressions. They are deep and are very poorly drained. They have a very dark gray, moderately fine textured surface layer and a mottled, moderately fine textured subsoil. Calcareous, medium-textured till is at a depth of 38 to 50 inches.

textured surface layer and a brown, medium-textured subsoil that is underlain by loamy alluvium.

Ross soils are deep, nearly level, and well drained. They have a very dark brown, medium-textured surface layer and a very dark brown, medium-textured subsoil [redacted]

and each individual soil occupies only a very small area at any one place. This association occupies about 13 square miles, or 3 percent of the county. The Miami soils make up 50 percent of the association; Crosby soils, about

ained Parke soils are on ridges and
e a brown, medium-textured surface
rt of the subsoil is medium textured
ish-brown. It is underlain by about
own silty clay loam. Below this, at a
id 144 inches, is yellowish-red sandy
les to sandy loam in the lower part.
erial, at a depth below 144 inches, is
vel and sand.

ained Miami soils are gently sloping
and are on hillsides. They have a
n-textured surface layer and a dark
derately fine textured subsoil. They
lcareous, medium-textured Wisconsin
f 24 to 42 inches. In this area there is
er older gravel and sand.

ained Negley soils are steep and are
ave a dark yellowish-brown and yel-
im-textured surface layer and a dark-
vn, and dark reddish-brown, moder-
l subsoil. They are underlain by
y fine textured to moderately coarse
Illinoian age at a depth of about 50
reous sand and gravel are at a depth

partly bypassed by the Wisconsin
he glacier rode up over some of the
along the sides of the hills, removing
laces it deposited a thin layer of re-

soils in this association are the well-
deep Fox soils; the well-drained
developed in windblown sand; small
iepin soils; and narrow areas of bot-

this association along Indiana High-
houses, nearly 70 percent of the acre-
and is now used for crops, orchards,
f the Negley soils are wooded or are

l in the use and management of these
main crops are corn, soybeans, small
ese soils cannot be farmed as inten-
level areas of the county. About 30
red land is in permanent pasture or
gley soils are used for trees or perma-

y of the general type. Most of the
ther associations. Some of the farmers
sture and hay and use the more nearly
joining associations for row crops.

small gravel pits in this association,
lly contains fine material and chunks
ravel. Except in small pockets, the
nmercial value.

soils of this association have severe
an development and for septic tank
soils and the gently sloping Miami
limitations. The gently sloping Parke
itations.

In a representative profile, the surface layer is dark grayish-brown fine sandy loam about 8 inches thick. The subsurface layer is about 8 inches of pale-brown fine sandy loam that contains yellowish-brown and light brownish-gray mottles. The subsoil is about 28 inches thick. It is friable, light brownish-gray loam that has light yellowish-brown and pale-brown mottles in the upper 7 inches. The middle 7 inches is firm, grayish-brown sandy clay loam that has yellowish-brown and brown mottles. The lower part is about 14 inches of firm, brown sandy clay loam that has grayish-brown and yellowish-brown mottles. The underlying material, at a depth of

	Area	Extent
	Acres	*Percent*
oes,	2, 810	1. 1
pes_	2, 944	1. 2
____	195	. 1
____	373	. 1
d___	267	. 1
____	196	. 1
____	7, 402	2. 8
____	1, 657	. 6
____	2, 852	1. 9
ed__	301	. 1
ed_	386	. 1
pes_	252	. 1
pes_	1, 136	. 4
ent		
____	1, 295	. 5
____	255	. 1
____	378	. 1
____	1, 936	. 7
pes_	309	. 1
____	5, 476	2. 1
____	580	. 2
____	1, 778	. 7
____	780	. 3
____	7, 143	2. 7
____	6, 295	2. 4
____	15, 700	6. 0
____	830	. 3
____	1, 946	. 7
iar-		
____	868	. 3
____	261, 760	100. 0

ish-brown and olive-
s firm, gray silty clay
h-brown mottles. The
about 44 inches and
vn, calcareous heavy

high organic-matter
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able moisture capac-
wetness. The seasonal
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rface. Most areas are
it are still forested.
n silty clay loam, in a
d U.S. Highway 421
vest of the southeast
R. 7 E.

(10YR 3/1) silty clay
granular structure; firm
t, smooth boundary.
7 (10YR 3/1) silty clay
ubangular blocky struc-
ck (10YR 2/1) films on
sts and root holes 1 to 2
neutral; clear, smooth

1) silty clay loam; com-
yellowish-brown (10YR

th of 10 to 20 inches by limestone bedrock. They are lands. The native vegetation was mixed hardwoods. a representative profile, the surface layer is very grayish-brown stony silt loam about 7 inches thick. ubsoil is about 8 inches of clay that is reddish brown upper 5 inches and dark brown in the lower part. are many stones mixed through the subsoil. The lying limestone is at a depth of 15 inches. Mate- rom the subsoil is in some cracks to a depth of about hes.

ydon soils have moderately slow permeability and available moisture capacity. They are slightly acid utral and are moderate to high in organic-matter nt. Runoff, erosion, and droughtiness are the main tions. Most areas are wooded, but some areas are manent pasture.

presentative profile of Corydon stony silt loam, 18 percent slopes, in a wooded area, 400 feet south and eet east of the northwest corner of the SE¼ sec. 9, N., R. 8 E.

—0 to 7 inches, very dark grayish-brown (10YR 3/2) stony silt loam; moderate, medium, granular structure; friable when moist; abundant roots; many stones on the surface; neutral; abrupt, wavy boundary.

21t—7 to 12 inches, reddish-brown (5YR 4/4) stony clay; moderate, medium, subangular blocky structure; very firm when moist; dark reddish-brown (5YR 3/2 and 3/3) clay films on ped faces; several stones; neutral; clear, wavy boundary.

22t—12 to 15 inches, dark-brown (7.5YR 4/4) stony clay; moderate, fine, angular blocky structure; very firm when moist; patches of dark reddish-brown (5YR 3/2 and 3/3) clay films on some peds; decomposing limestone rocks; calcareous; moderately alkaline; abrupt, irregular boundary.

—15 inches +, gray limestone bedrock that contains numerous cracks filled with weathering soil material; some cracks extend to a depth of 24 inches or more.

The solum ranges from 10 to 20 inches in thickness. The A orizon ranges from dark brown (10YR 2/2) to very dark ayish brown (10YR 3/2) in color and from 3 to 8 inches in ickness. The B horizon ranges from 5 to 15 inches in thick- ss, from silty clay to clay in texture, and from reddish own (5YR 4/4) to dark brown (10YR 4/3) in color.

Corydon soils are on similar terrain to that occupied by ennepin and Rodman soils. Corydon soils contain stones roughout the soil and have finer textured material in the bsoil than Hennepin soils, which developed in loam till, or dman soils, which developed in stratified gravel and sand. ie well-drained Corydon soils are closely associated on the ndscape with the nearly level, somewhat poorly drained andolph soils and the gently sloping, well-drained Milton ils.

ydon stony silt loam, 18 to 35 percent slopes—This soil is steep and very steep and is underlain by one bedrock. About 5 to 15 percent of this unit con- f limestone outcrops (fig. 8).

luded in mapping are a few areas of colluvial soil at ase of the slopes. Some moderately steep areas that only a few outcroppings of stone are included. Also led are soils that have been plowed or eroded and surface color of brown or dark brown.

noff is rapid to very rapid. Runoff, erosion, and htiness are the main limitations to use and manage- of this soil. Shallow soil depth, slope, and stoniness imit use and management. This soil is not suited to rops but can be used for permanent pasture or Permanent vegetative cover is needed to control n. (Capability unit VIIe–2)

corn and soybeans. (Ca-

rcent slopes (CrB).—This
breaks, low knolls, ridge-
drainageways. In places
areas have short slopes.
om 3 to 20 acres. In a few
noderate amount of mate-
material from the origi-

l areas of Brookston soils
Pleasant View are soils
l and a somewhat thinner
e slowly than similar soils
delaying fieldwork.
to use and management
in hazard. Runoff is slow.
eeded on some slopes. If
nd managed, this soil is
the county. (Capability

6 percent slopes (CsB).—
vhat poorly drained and
small to map separately.
t Crosby soils, 25 percent
ier soils. In areas where
oils are on the lower and
ie Miami soils occupy the
s the Crosby soils occupy
are on the lower part of
ie Miami soils are on the
nd ridges.
loam is similar to the one
the series, except that in
e layer has been removed
Miami silt loam is similar
tative for the series, ex-
yer contains a moderate
soil mixed with the orig-
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low areas, 6 to 12 inches
ted on the surface.
ll areas of alluvial soils
knolls. In some drainage-
areas of Brookston soils.
ted by wetness. There is
knolls and ridges. In the
some of the low, marshy
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tillage or use of grass in
help control erosion. In
blish an adequate outlet

y drained and properly
d, they are suited to most
(Capability unit IIe–12)

deep, moderately well
utral to moderately alka-
ls are on flood plains of
ibutaries and on narrow

flood plains that extend into the uplands. The native vegetation was [redacted]

Included in mapping are some soils that have a loam [redacted]

of the narrow
included are a
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This soil is suit-
1)

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There are com-
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soils that have
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a hazard. This
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alfalfa. Crops
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slopes. A few
s and tomatoes.
Capability unit

d (FoC2).—This
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Depth to the
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severely eroded
ave gravel and
ncluded on the
of Miami soils.
Township are a
, and in places
on or near the

.um or rapid. This soil is droughty during there is also an erosion hazard. On kames in Jackson Township, this soil is not so the stream terrace breaks. This soil is ps common in the county, but it is better ep-rooted crops as alfalfa and fall-seeded n to such crops as corn and soybeans that damaged if rainfall were below normal. IIIe–9)

to 18 percent slopes, eroded (FoD2).—This), eroded soil is on terrace breaks or hill- erraces. The slopes are short and irregu- his soil has a profile similar to that de- sentative for the series, except that it has ıner solum and in places part of the sur- een removed by erosion. The present sur- sts of a mixture of material from the layer and a moderate amount of material brown clay loam subsoil. Depth to the el and sand is mainly 24 to 30 inches. apping are soils that have loose sand and ı of less than 24 inches. Included are some soils that are severely eroded. Also in- small areas of steeper Rodman soils. On Marietta are small included areas of nepin soils. On the high ridge in Jackson are small included areas of Miami and l in this area there are a few large chunks rel on or near the surface.

id. This soil is droughty, and there is an It is not so droughty on the kames and on in Jackson Township as on the stream This soil is suited to all cultivated crops county if erosion and other hazards are better suited to deep-rooted crops, such all-seeded small grains, than to such crops /beans that would likely be damaged if ow normal. (Capability unit IVe–9)

amy substratum, 0 to 3 percent slopes ly level to gently sloping soil is in areas es that have a thin layer of gravel and on calcareous, moderately alkaline loam as a profile similar to that described as or the series, except that there is only a avel and sand between the subsoil and the n till. The thickness of the loose gravel between the subsoil and the underlying till 20 inches but is dominantly 8 to 15 inches. extend through the loose sand into the

mapping are small areas of somewhat ınd poorly drained soils.

ely permeable soil has a moderate or high ire capacity. Runoff is slow. This soil is ghty during very long dry seasons. It is ivated crops common in the county. Crops oil are less likely to be damaged by dry ops grown on other Fox soils. This soil is ion. (Capability unit IIs–1)

m, 2 to 6 percent slopes, severely eroded ıtly sloping, severely eroded soil occupies ıd narrow, elongated ridges in areas of ı and Nineveh soils. This soil has a profile similar to the one described as representative for the series, except that it has a somewhat thinner solum and most of the original surface layer has been removed by erosion. The present surface layer consists mainly of material from the dark-brown clay loam subsoil. Depth to the underlying loose gravel and sand is 24 to 30 inches.

Included in mapping are small areas of soils that have a loam and gravelly clay loam surface layer. In places soils are included that have loose gravel and sand at a depth of less than 24 inches.

Runoff is slow to medium. Erosion is a hazard, and droughtiness limits the use and management of this soil. This soil is suited to all crops common in the county, but it is better suited to such deep-rooted crops as alfalfa and fall-seeded small grains than to such crops as corn and soybeans that would likely be damaged if rainfall were below normal. Crops grown on this soil are affected by dry weather earlier than crops grown on Fox loam, 0 to 2 percent slopes. This soil is suited to irrigation. (Capability unit IIIe–9)

Fox clay loam, 6 to 12 percent slopes, severely eroded (FxC3).—This severely eroded soil is on the terrace breaks. Slopes are short and irregularly shaped. The soil areas range in size from 3 to 10 acres. This soil has a profile similar to the one described as representative for the series, except that it has a somewhat thinner solum and the original surface layer has been removed by erosion. The present surface layer consists mainly of material from the dark-brown clay loam subsoil. Depth to the underlying gravel and sand is mainly 24 to 30 inches.

Included in mapping are soils that have loose sand and gravel at a depth of less than 24 inches. Small areas of this soil have a gravelly clay loam surface layer. On the kames near Marietta, small areas of Miami soils are included. On the high ridges in Jackson Township, a few chunks of cemented gravel are on or near the surface, and in a few small areas Parke and Miami soils are also included.

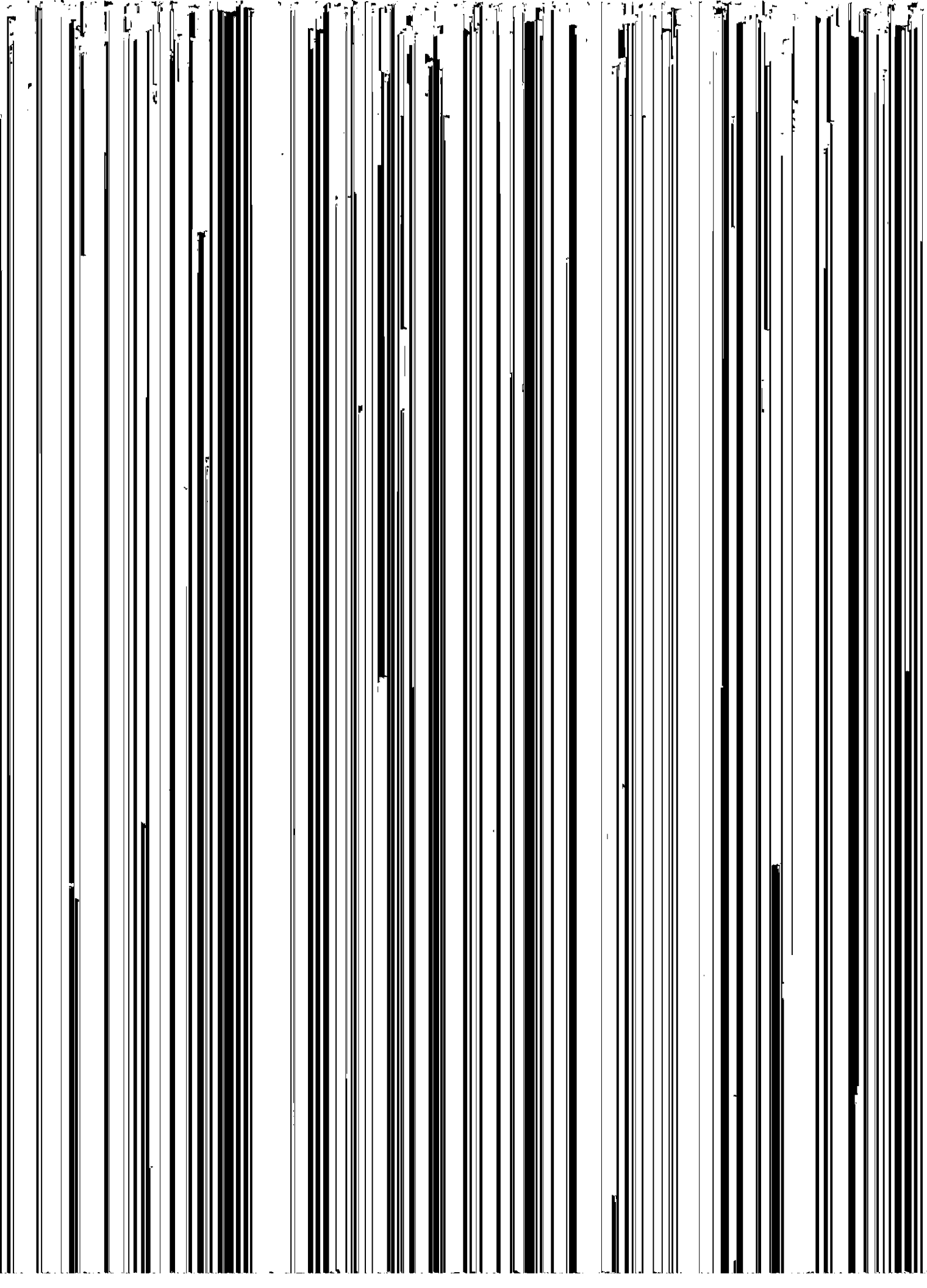
Runoff is medium or rapid. This soil is droughty during dry seasons. There is an erosion hazard. On kames and high ridges in Jackson Township, this soil is not so droughty as on the stream terrace breaks. If erosion and other hazards are controlled, this soil is suited to cultivated crops common in the county. It is better suited to such deep-rooted crops as alfalfa or fall-seeded small grains than to corn and soybeans, which would likely be damaged if rainfall were below normal. (Capability unit IVe–9)

Genesee Series

The Genesee series consists of deep, well-drained soils on flood plains. These soils occupy the nearly level areas adjacent to the major drainageways. They formed in alluvium washed from areas of calcareous glacial till. The native vegetation was hardwood forests.

In a representative profile, the surface layer is about 10 inches of dark-brown loam. The subsoil is about 16 inches of calcareous, moderately alkaline, brown friable loam. The underlying material is at a depth of about 26 inches and consists of calcareous, moderately alkaline, brown stratified loam, sandy loam, and gravelly loam.

Genesee soils have moderate organic-matter content. They are neutral to moderately alkaline. They have a



rk-brown (10YR 3/3) worm casts; bbles; calcareous; moderately alka- oth boundary.
own (10YR 5/3) loam till; massive; oist; common till pebbles; roots ex- veathering cracks; calcareous; mod- .

m 10 to 20 inches in thickness, but it es thick. The A horizon is dark gray- or dark brown (10YR 4/3). The B clay loam 4 to 12 inches thick. The B (10YR 4/3), dark yellowish brown (10YR 5/3). The C horizon is mainly ndy loam to clay loam.
an, and Corydon soils are on similar s have a finer textured profile than ormed in stratified gravel and sand. oting zone than Corydon soils, which d are underlain by limestone bedrock 0 inches. The well-drained Hennepin ated on the landscape with the well- and the somewhat poorly drained epin soils are steeper than the Miami

o 25 percent slopes (HeE).—This aks and hillsides along drainage-

; are small areas of deeper well- mmit of the slopes and on small mall, shallow gullies are included ed for pasture.
id runoff and is highly susceptible tion is removed. This soil is not erly managed, it is suited to per- ited to woodland and, with proper uce moderate to rapid growth of -poplar. (Capability unit VIIe–2)
o 50 percent slopes (HeF).—This rt breaks and hillsides along some vays. This soil has the profile de- e for the series.
; are some areas of deeper well- mit of slopes and on intersecting few small gullies are included in e used for pasture.
pid runoff and is highly susceptibi- getation is removed. It is suited to oper management, produces mod- of such hardwood trees as tulip- t VIIe–2)

consists of deep, very poorly ils are in low depressions on up- e native vegetation was water-tol- d hardwoods.
rofile, the surface layer is about 22 am. The upper part is very dark rt is black. The subsoil is about 20 that is dark gray in the upper 14 e lower 6 inches. The subsoil has yellowish-brown, olive-brown, and s. The underlying material is at a ches and consists of calcareous, ray stratified gravelly clay loam, velly clay. Loose calcareous gravel th of 72 inches.

silty clay, clay, and silt and limestone bedrock is at a depth of 42 inches or more. On the uplands it is underlain by loam till. The soil areas range from 3 to 25 acres in size.

Included in mapping are small areas of Brookston, Westland, and Sebewa soils. In places included soils have shells in the profile and are moderately alkaline throughout. Also included are some soils that have a clay loam surface layer and a few small areas of soils that have a thin layer of muck on the surface.

Wetness is the main limitation to farming. Runoff is very slow, and the water table is near the surface most of the year. In undrained areas water ponds on the surface during wet weather. A few low areas are subject to flooding. In places it is difficult to get an adequate outlet for a drainage system. Most undrained areas are used for pasture or water-tolerant trees. If adequately drained and managed, this soil is suited to crops. Corn and soybeans are the main row crops. If worked too wet, this soil is subject to puddling and becomes hard and cloddy upon drying. (Capability unit IIw–1)

Linwood Series

The Linwood series consists of deep, very poorly drained soils that have a muck surface layer 12 to 42 inches thick. These soils are in depressions near the base of slopes that are gravelly or have a stratum of water-bearing gravel that keeps the lower area saturated with water. The constant saturation favors the growth of organic matter but restricts its decomposition. The native vegetation was water-tolerant hardwood trees, sedges, and grasses.

In a representative profile, the muck layer is about 30 inches thick and has granular structure. It has two main parts. The upper 22 inches is black muck, and the lower 8 inches is black muck mottled with dark yellowish-brown. There is some decomposing, fibrous material below a depth of 22 inches. The underlying material is at a depth of about 30 inches and consists of gray, moderately alkaline, calcareous sandy clay loam.

Linwood soils are very high in organic-matter content and have a high available moisture capacity. They are naturally low in available phosphate and potash. Permeability is rapid in the muck and slow in the underlying material. Wetness is the main limitation to farming.

Some areas are drained and are used for crops. Undrained areas are in water-tolerant trees, bushes, and sedges.

Representative profile of Linwood muck, in a cultivated field, 1,026 feet south and 200 feet west of the northeast corner of NE¼ sec. 24, T. 13 N., R. 5 E.

Oa1—0 to 8 inches, black (10YR 2/1) muck; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

Oa2—8 to 22 inches, black (10YR 2/1) muck; moderate, coarse, granular structure; friable when moist; neutral; gradual, wavy boundary.

Oa3—22 to 30 inches, black (10YR 2/1) muck; some dark yellowish-brown (10YR 3/4) mottles; moderate, coarse, granular structure; friable when moist; few, decaying, fibrous roots; neutral; clear, smooth boundary.

IIC—30 to 53 inches, gray (N 5/0), moderately alkaline, calcareous sandy clay loam.

The muck ranges from 12 to 42 inches in thickness. In places there are layers of decomposing wood and leaves.

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organic-matter content and are neutral. These soils are subject to flooding during winter and early in spring. They are mainly used for crops, but small areas are in permanent pasture.

Representative profile of Medway silt loam, in a culti-

ks along drainageways on up-
ty. The native vegetation was

le, the surface layer is about 6
loam. The subsoil, about 34
nches of dark yellowish-brown,
per part. The middle 25 inches
nd yellowish-brown, firm clay
inches of dark-brown, firm clay
terial, at a depth of about 40
and yellowish-brown, calcare-

ately slow permeability and a
apacity. The surface layer is
s been limed. These soils are
matter content. Erosion is the
sloping. Most areas are culti-
in permanent pasture or trees.
f Miami silt loam, 2 to 6 per-
ıltivated field 660 feet east and
orthwest corner of sec. 15, T.

brown (10YR 4/3) silt loam, pale
) when dry; weak, medium, gran-
riable when moist; several roots;
ls less than 1 millimeter in diam-
asts; few small pieces of dark yel-
YR 4/4) material; medium acid,
undary.
yellowish-brown (10YR 4/4) heavy
rate, medium, subangular blocky
hen moist; patches of dark-brown
films on faces of peds; few worm
les; few voids; medium acid; clear,

k yellowish-brown (10YR 4/4) clay
medium, subangular blocky struc-
noist; dark-brown (7.5YR 3/3) clay
on faces of peds and on pebbles;
ks; few 1- to 5-millimeter voids in
eds; strongly acid; clear, smooth

yellowish-brown (10YR 5/4) clay
medium and some coarse, suban-
ture; firm when moist; dark-brown
films continuous on faces of peds
few small voids less than 1 milli-
r in ped interiors; few black con-
acid; abrupt, wavy boundary.
rk-brown (7.5YR 3/2) clay loam;
ıbangular blocky structure; firm
fine voids coated with dark-brown
films; clay films on faces of peds
neutral; abrupt, wavy boundary.
ı (10YR 5/3) and yellowish-brown
few streaks of dark-brown (7.5YR
tend into cracks; calcareous; mod-

24 to 42 inches in thickness. The
R 5/3), dark brown (10YR 4/3), or
YR 4/4). In wooded areas the A1
own (10YR 4/2) or very dark gray-
ı A2 horizon of brown (10YR 5/3)
5/4) silt loam 2 to 6 inches thick
and B1 horizons generally contain
y. The B1 horizon is loam or silt
he B2 horizon is clay loam or silty
m dark brown (7.5YR 3/2) to yel-
n color.
Parke soils are on similar locations.
thinner solum and have less sand
ı Princeton soils. They are less acid
than Parke soils. The well-drained

Miami soils are closely associated on the landscape with the very poorly drained Brookston soils in depressions, the somewhat poorly drained, nearly level Crosby soils, and the shallow, well-drained Hennepin soils, which are steeper.

Miami silt loam, 2 to 6 percent slopes, eroded (MIB2).—This gently sloping, eroded soil is on low knolls, ridgetops, and breaks adjacent to drainageways. This soil is on uplands throughout the county and ranges in size from 3 to more than 40 acres. This soil has the profile described as representative for the series. In wooded areas the upper 2 to 3 inches of the surface layer is dark grayish brown.

Small areas of somewhat poorly drained and poorly drained soils are included on the lower slopes and in some drainageways. A few severely eroded soils are also included. Included near Pleasant View are soils that have a finer textured subsoil and a somewhat thinner solum. Soils in this area dry out slower following rains than similar soils in other parts of the county, thus delaying fieldwork. On the high ridges in Jackson Township this soil is underlain by gravel and sand at a depth of 8 to 15 feet. In this area part of this soil has a reddish-brown subsoil, and in places the subsoil is very strongly acid. Also included are small areas of Parke soils. If ponds are built in this area, they are subject to leaking.

Runoff is slow to medium. Erosion is the main hazard if this soil is cultivated. This soil is suited to all crops common in the county if it is managed properly and if erosion is controlled. (Capability unit IIe–1)

Miami silt loam, 6 to 12 percent slopes, eroded (MIC2).—This sloping, eroded soil is adjacent to drainageways, on knolls, and on narrow, elongated ridges between steeper drainageways. Soil areas are irregularly shaped and range in size from 2 to 10 acres. This soil has a profile similar to that described as representative for the series, except that it is somewhat thinner. Depth to the underlying limy till is 24 to 30 inches.

Some soils near the center of the slopes have calcareous till at a depth of less than 24 inches. Also included in mapping are severely eroded soils. On the lower part of some slopes and in some drainageways, are some small areas of somewhat poorly drained and poorly drained soils. Included near Pleasant View are soils with a fine-textured subsoil. Soils in this area dry out slower than similar soils in other parts of the county, thus delaying fieldwork. On the high ridges in Jackson Township sand and gravel are at a depth of 6 to 15 feet. In this area part of the soil has a reddish-brown subsoil, and in some places the subsoil is very strongly acid. Also included are a few small areas of Parke soils. If ponds are built in this area, they are subject to leaking.

Runoff is medium. Erosion is the main hazard in the use and management of this soil. This soil is suited to all crops common in the county, provided it is properly managed and erosion is controlled. It is suited to permanent pasture or woodland. (Capability unit IIIe–1)

Miami silt loam, 12 to 18 percent slopes, eroded (MID2).—This moderately steep, eroded soil is on breaks along the major drainageways and on hillsides. This soil has a profile similar to that described as representative for the series, except that it has a somewhat thinner solum. Depth to the underlying till is mainly 24 to 30 inches. The upper 2 or 3 inches of the surface layer is dark colored in wooded areas.

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hat have sand and
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ed to small grains,
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nty, thus delaying
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soil are included.

Soils in this area dry slower than similar soils in other parts of the county, thus delaying fieldwork. On the high ridges in Jackson Township the soil is underlain by sand and gravel at a depth of 5 to 15 feet. In this area part of the subsoil is reddish brown, and in some places it is very strongly acid. Also included in this area are small areas of Parke soils. Ponds built in this area are subject to leaking.

The water intake rate is slower than in the less sloping Miami soils. Runoff is medium or rapid. Erosion is the main hazard in use and management of this soil. If properly managed and if erosion is controlled, this soil is suited to small grains, hay, and pasture. It is also suited to an occasional row crop if erosion is controlled. If this soil is plowed when too wet, large clods, which become very hard when dry, are likely to form. This condition greatly hinders preparation of a good seedbed. (Capability unit IVe–1)

Miami clay loam, 12 to 18 percent slopes, severely eroded (MmD3).—This severely eroded, moderately steep soil is on breaks along the major drainageways and on hillsides. This soil has a profile similar to that described as representative for the series, except that it has a somewhat thinner solum and erosion has removed most of the original surface layer. The present plow layer consists mainly of yellowish-brown or brown subsoil. In places there are a few gullies.

Some areas of soil near the center of the slopes have calcareous till at a depth of less than 24 inches. In some small areas, limy till is exposed on the surface. Also included in mapping are small areas of steep Hennepin soils. In some drainageways there are included small areas of alluvial soils. On the high ridges in Jackson Township this soil is underlain by sand and gravel at a depth of 4 to 10 feet. In this area part of this soil has a reddish-brown subsoil, and in places the subsoil is very strongly acid. Also included are small areas of Negley soils. Ponds are subject to leaking if built in this area.

Runoff is rapid. If cultivated, this soil is subject to severe erosion. This soil is suited to hay or pasture if managed properly and if erosion is controlled. This soil is difficult to plow and becomes cloddy when dry. (Capability unit VIe–1)

Miami-Crosby silt loams, 0 to 6 percent slopes (MrB).—This complex consists of well-drained and somewhat poorly drained soils that formed in glacial till on uplands. This complex is mainly in the hummocky areas. It consists of about 60 percent Miami soils, 25 percent Crosby soils, and 15 percent other soils that are too small to map separately. Miami silt loam is on the higher knolls and ridges. The Crosby soils are on the low knolls and ridges and on some of the nearly level areas between them.

The Miami part of this complex has a profile similar to that described as representative for the Miami series. The Crosby part of the complex has a profile similar to that described as representative for the Crosby series, except that in places part of the original surface layer has been removed by erosion. In some small areas the subsoil is exposed at the surface. In some of the low areas and pockets 6 to 12 inches of silty material has been deposited on the surface.

Included in mapping are small areas of Brookston and Shoals soils in low swales and in pockets between ridges

son ranges from 12 to 20 inches in
2 to 16 inches thick. In some areas
(10YR 5/2 or 2.5Y 5/2) or dark
) B1 horizon mottled with yellow-
nd 5/6). The B2 horizon is gray
or grayish brown (10YR 5/2 and
h heavy silty clay loam to clay in

nd Westland soils are on similar
lave a finer textured subsoil than
med in loam till, or Westland soils,
tratified sand and gravel. The very
soils are closely associated on the
what poorly drained Randolph and
ils.

m (0 to 2 percent slopes) (Ms).—
narrow depressions and other
nderlain by limestone.
re some places that have a few
erately alkaline gravelly loam
soil and the bedrock. Some in-
rs and limestone fragments just
ded in mapping are soils that
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inches deep to the underlying

itation to use and management
w or very slow. In places it is
e outlet for a drainage system.
too wet, is subject to puddling
ddy upon drying. This soil is
ounty if it is properly managed
Corn and soybeans are the
it IIIw–5)

ists of moderately deep, well-
ormed in a thin layer of glacial
ne bedrock at a depth of 24 to
level to gently sloping and are
the county near the Flatrock
on was hardwood forests.
ile, the surface layer is about 8
brown silt loam. The subsoil is
is dark brown. The upper 15
e lower 7 inches is gravelly clay
terial is limestone bedrock at a

ate permeability and a low to
re capacity. They are naturally
tent. The surface layer is me-
unless it has been limed. These
ty during long dry seasons.
inly for crops, but a few areas

f Milton silt loam, 1 to 6 per-
l field 820 feet east and 20 feet
orner of the SW¼ sec. 22, T.

yellowish-brown (10YR 3/4) silt
medium, granular structure; friable
ndant roots; several 1- to 2-milli-
and worm casts; neutral; abrupt,

rk-brown (7.5YR 4/4) clay loam;
n, granular structure; friable when

[redacted]

o 18 percent slopes, eroded (NeD2).—
eep, eroded soil is on hillsides and
geways. The soil areas are irregularly
size from 5 to 20 acres. This soil has
as representative for the series.
ing are some areas of severely eroded
eas of Rodman, Hennepin, and Miami
n some ridgetops the surface layer is

e water is moderate. Erosion is the
oil is suited to small grains, hay, and
properly and if erosion is controlled.
)-rooted trees, such as black walnut.
e–9)

o 25 percent slopes (NeE).—This steep
and on side slopes of drainageways.
d abandoned gravel pits in areas of
there are large chunks of cemented
A few areas are severely eroded and

ping are some soils that slope more
the included steeper areas the depth
us sand and gravel is 6 to 10 feet. In
few small areas of Rodman and
ded.
Erosion is the main hazard in the use
this soil. This soil is suited to perma-
ay if it is properly managed and if
l. It is suited to trees, and some areas
f black walnut and black cherry trees.
e–1)

es consists of well-drained soils that
p over sand and gravel. These soils
aterial, and depth to the underlying
sand ranges from 24 to 42 inches.
early level and gently undulating and
outwash terraces. The native vegeta-
woods and grasses.
e profile, the surface layer is about 13
n loam. The subsoil is about 23 inches
) inches is firm, dark-brown gravelly
r 3 inches is dark reddish-brown grav-
gues of this material extend 6 to 20
derlying material. The underlying
pth of about 36 inches and consists of
h-brown, pale-brown, and light-gray,
and gravel.
ls are moderately permeable in the
apidly permeable in the underlying
e a low to moderate available mois-
organic-matter content is naturally
ayer is medium acid unless it has been
re droughty during long dry seasons.
for crops, but some areas are used for

rofile of Nineveh loam, 0 to 2 percent
ted field 300 feet north and 75 feet
st corner of sec. 26, T. 11 N., R. 5 E.

s, dark-brown (7.5YR 3/2) loam, grayish
)YR 5/2) when dry; weak, medium, gran-
ture; friable when moist; few ¼- to 1-inch pebbles; few wormholes and worm casts; neutral; abrupt, smooth boundary.

A3—8 to 13 inches, dark-brown (7.5YR 3/2) loam; weak, medium, subangular blocky structure; friable when moist; few ¼- to ¾-inch pebbles; few 1- to 3-millimeter voids; neutral; clear, smooth boundary.

B21t—13 to 24 inches, dark-brown (7.5YR 4/4) gravelly clay loam; moderate, medium, subangular blocky structure; firm when moist; dark-brown (7.5YR 3/2) clay films continuous on faces of peds and on pebbles; few ½- to 1-inch pebbles; few 1- to 3-millimeter voids; neutral; clear, smooth boundary.

B22t—24 to 33 inches, dark-brown (7.5YR 4/4) gravelly clay loam; moderate, medium and coarse, subangular blocky structure; firm when moist; dark-brown (7.5YR 3/2) clay films continuous on faces of peds and on pebbles; neutral; clear, irregular boundary.

B3t—33 to 36 inches, dark reddish-brown (5YR 3/2) gravelly clay loam; weak, coarse, subangular blocky structure; firm when moist; dark reddish-brown (5YR 3/2) clay films continuous on faces of peds; neutral to mildly alkaline; abrupt, irregular boundary.

IIC—36 to 54 inches, yellowish-brown (10YR 5/4), pale-brown (10YR 6/3), and light-gray (10YR 7/2), loose, stratified gravel and sand; tongues of material from the B3t horizon extend to a depth of 45 to 58 inches and are 18 to 24 inches apart; calcareous; moderately alkaline.

The solum ranges from 24 to 42 inches in thickness but is normally 30 to 40 inches thick. The Ap horizon is dark brown (7.5YR 3/3 and 7.5YR 3/2 and 10YR 3/3) or very dark grayish brown (10YR 3/2). The A horizon is 10 to 15 inches thick. There is a brown (7.5YR 5/4) loam B1 horizon 2 to 4 inches thick in some areas. The B2 horizon is clay loam or gravelly clay loam and ranges from reddish brown (5YR 4/4) through dark brown (7.5YR 4/4). Tongues of material from the B3 horizon extend 6 to 20 inches into the IIC horizon and are 12 to more than 36 inches apart.

Nineveh, Fox, and Ockley soils are on similar terrain. Nineveh soils are darker colored than Fox soils. They are darker colored and have a thinner solum than Ockley soils, which are underlain by loose gravel and sand at a depth of 42 to 60 inches.

Nineveh loam, 0 to 2 percent slopes (NnA).—This nearly level soil is on terraces along the major streams in the county. These terraces are 4 to 20 feet above the adjacent flood plains. The soil areas range in size from 5 to more than 160 acres. This soil has the profile described as representative for the series. In places 30 to 50 percent of the soil at a depth of 40 to 48 inches consists of tongues of material from the subsoil extending into the underlying gravel and sand. In areas where this soil grades to Fox soils, the dark-colored surface layer is thinner and, in places, somewhat lighter in color.

Included in mapping are small areas of soils with a gritty silt loam, fine sandy loam, and gravelly loam surface layer. There are small areas of somewhat poorly drained and poorly drained soils in some of the narrow remnants of old stream channels. Also included are gently undulating Nineveh soils on small, elongated ridges.

Surface runoff is slow. This soil is droughty in dry seasons. It is suited to all crops common in the county. Fall-seeded small grains and deep-rooted crops, such as alfalfa, are least affected when rainfall is below normal. This soil is suited to irrigation. (Capability unit IIs–1)

Nineveh loam, 2 to 6 percent slopes (NnB).—This soil is on narrow, elongated ridges, on gently undulating areas, and on side slopes of drainageways on the terraces. The slopes are short and very irregularly shaped. Areas of this soil range in size from 3 to 20 acres and are commonly

intermixed with areas of Nineveh loam, 0 to 2 percent slopes.

This soil has a profile similar to that described as representative for the series, except that part of the original surface layer has been removed by erosion. The present surface layer consists of a mixture of material from the original surface layer and a moderate amount of material from the dark-brown gravelly clay loam subsoil. There generally are several pebbles on the surface of this soil. Depth to the underlying loose gravel and sand is 24 to 28 inches. Only a few tongues of subsoil extend into the underlying material.

es, yellowish-brown (10YR 5/4) and pale-
0YR 6/3) stratified gravel and sand; cal-
moderately alkaline.

es from 42 to 60 inches in thickness, but is
ches thick. The Ap horizon is brown (10YR
own (10YR 5/4), or dark yellowish brown
A2 horizon is lacking in some places. In
s a 2- to 5-inch B1 horizon of brown (10YR
pper B2 horizon is clay loam or sandy clay
art of the B2 horizon is clay loam or grav-
ie B2 horizon is dark reddish brown (5YR
vn (5YR 4/3), or dark brown (7.5YR 4/4).
ere is a B3 horizon of dark-brown (7.5YR
ish-brown (5YR 3/4) gravelly clay loam.
d Nineveh soils formed in similar materials
r terrain. Ockley soils have a thicker solum
ineveh soils and are lighter colored than
well-drained Ockley soils are closely asso-
lscape with the very poorly drained West-
newhat poorly drained Sleeth soils, and the
soils.

o 2 percent slopes (OcA).—This nearly
outwash plains and stream terraces
eams. The soil areas range in size from

ping are small areas that have a gritty
layer. In a few places depth to the
and is less than 42 inches. In some
ie lower part of the subsoil are 3 feet
to a depth of about 50 inches, and
el and sand at a depth of about 36
tongues. In areas where the seasonal
depth of 40 to 50 inches, there are a
elow a depth of 30 inches. Some areas
gravelly loam layer at a depth of 30
nis layer is underlain by loose gravel
below 48 inches.
ere limitations to use of this soil. Sur-
and the erosion hazard is slight. This
oughty in extremely long dry seasons.
ops common in the county. (Capabil-

consists of deep, well-drained soils.
in a mantle of loess 18 to 42 inches
derlying strongly weathered, reddish,
outwash material. Stratified, calcare-
l are generally at a depth of 10 to 15
sloping to sloping soils are on ridges.
ion was hardwood forests.
ve profile, the surface layer is about 7
loam. The subsoil extends to a depth
nches and has four main parts. The
rk yellowish-brown, friable silt loam;
firm, dark-brown silty clay loam; the
m, yellowish-red sandy clay loam; and
s is friable, yellowish-red sandy clay
n. The underlying material is loose,
s gravel and sand and is at a depth of

noderate. The available moisture ca-
se soils are naturally low in organic-
surface layer is strongly acid unless it
osion is the main hazard if these soils

are cultivated. They are used for crops, pasture, and trees.

Representative profile of Parke silt loam, 2 to 6 percent slopes, eroded, in a cultivated field 240 feet south and 820 feet west of the northeast corner of the NW¼ sec. 31, T. 11 N., R. 6 E.

Ap—0 to 7 inches, brown (10YR 4/3) silt loam; weak, fine and medium, granular structure; friable when moist; few pebbles on the surface; a few pieces of subsoil mixed into the matrix; medium acid; abrupt, smooth boundary.

B1t—7 to 14 inches, dark yellowish-brown (10YR 4/4) heavy silt loam; moderate, medium, subangular blocky structure; friable when moist; few patchy clay films on faces of peds; very strongly acid; clear, smooth boundary.

B21t—14 to 24 inches, dark-brown (7.5YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; firm when moist; dark-brown (7.5YR 4/4) clay films continuous on faces of peds; a few fine sand grains; very strongly acid; clear, smooth boundary.

IIB22tb—24 to 50 inches, yellowish-red (5YR 5/6) sandy clay loam; moderate, medium, subangular blocky structure in the upper 10 inches and gradually becoming weaker and coarser with depth; firm when moist; yellowish-red (5YR 5/6 and 4/6) clay films on faces of peds; clay bridging between sand grains; few pebbles; few black concretions in lower 6 inches; very strongly acid; gradual, wavy boundary.

IIB3tb—50 to 144 inches, yellowish-red (5YR 5/6) light sandy clay loam gradually changing to sandy loam; streaks of red (2.5YR 4/6 and 4/8) and reddish yellow (5YR 6/6); massive to weak, coarse, subangular blocky structure; friable when moist; red (2.5YR 4/6) clay bridging between sand grains; layers of gravelly clay loam to gravelly loam; very strongly acid and becoming neutral in the lower part; gradual, irregular boundary.

IIC—144 to 155 inches, loose, moderately alkaline, calcareous sand and some gravel layers.

The loess ranges from 18 to 42 inches in thickness but is mainly less than 30 inches. The Ap horizon is brown (10YR 4/3) or dark yellowish brown (10YR 4/4). In some areas there is an A2 horizon 3 to 6 inches thick that is dark grayish-brown (10YR 4/2) silt loam. In wooded areas the A1 horizon is 1 to 3 inches thick and is very dark grayish-brown (10YR 3/2) silt loam. The lower part of the B2 horizon is clay loam, gravelly clay loam, or sandy clay loam. The B3 horizon is generally at a depth of 45 to 65 inches. The loose, calcareous gravel and sand are at a depth of 10 to 15 feet but are lacking in some areas.

Parke soils are associated in Shelby County with Negley, Miami, and Fox soils. The Parke soils are thicker, more acid, and have fewer pebbles in the upper part of the solum than Fox soils, which formed in gravel and sand that is loose at a depth of 24 to 42 inches. The Parke soils are thicker, redder, more acid, and have fewer pebbles in the upper part of the solum than Miami soils, which formed in loam till that is calcareous at a depth of 24 to 42 inches. The Parke soils have fewer pebbles in the upper part of the solum than Negley soils, which formed in similar material except that the mantle of loess is only 0 to 18 inches thick.

Parke silt loam, 2 to 6 percent slopes, eroded (PaB2).—This gently sloping, eroded soil is on ridges. It has the profile described as representative for the series.

Included in mapping are a few small areas of severely eroded soils. A few small areas of Miami soils and Fox soils are also included. In a few areas the upper part of the soil has characteristics of Miami soils, and the lower part has characteristics of Parke soils. Runoff is slow or medium. Erosion is the main hazard.

If properly managed and if erosion is controlled, this soil is suited to all crops common in the county. It is also suited to pasture. It is suited to trees and is ideally suited

Capability

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Melons and

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sandy loam;
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3/3) worm
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) fine sandy
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th boundary.
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) sandy clay
blocky struc-

ture; firm when moist; continuous, reddish-brown (5YR 4/4) clay films on ped faces; few old holes filled with streaks of dark yellowish-brown sand; strongly acid; clear, wavy boundary.

B23t—38 to 47 inches, brown (7.5YR 5/4) heavy sandy loam; weak, coarse, subangular blocky structure; friable when moist; dark-brown (7.5YR 4/4) clay films on some ped faces; medium acid in upper part and slightly acid in lower part; clear, wavy boundary.

C—47 to 65 inches, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/4 and 10YR 5/6) fine sand and some minor streaks of silt; neutral to a depth of 57 inches; calcareous, moderately alkaline at a depth below 57 inches.

The thickness of the solum ranges from 42 to 60 inches. The color of the Ap horizon ranges from dark brown to brown or dark grayish brown. In uncultivated areas the A1 horizon is very dark grayish-brown sandy loam 1 to 4 inches thick. Some profiles lack the B1 horizon. The B2 horizon is dark brown (7.5YR 4/4), reddish brown (5 YR 5/4 and 5/6), or yellowish brown (10YR 5/4 and 5/6). It is sandy clay loam or clay loam in the upper part and sandy loam or sandy clay loam in the lower part. A B3 horizon of dark reddish-brown (5YR 3/4) or dark-brown (7.5YR 4/4) sandy loam occurs in some profiles.

Princeton soils are similar to Martinsville and Ockley soils in thickness and color. In most areas Princeton soils have more sand in the subsoil than Martinsville soils, which have a clay loam subsoil and are underlain by stratified sand and silt. Princeton soils have less gravel in the profile than Ockley soils, which formed in gravel and sand. Princeton soils are well drained and are generally closely associated with the somewhat poorly drained Ayrshire soils.

Princeton fine sandy loam, 0 to 2 percent slopes (PrA).—This soil is in the western part of the county near sandy ridges.

Included in mapping are small areas of somewhat poorly drained soils and soils that have a loam surface layer. Also included are a few small areas of gently undulating soils.

Runoff is slow, and this soil is somewhat droughty during long dry seasons. It is suited to all crops common in the county. It is also suited to woodland, especially deep-rooted trees, such as black walnut. This soil is well suited to irrigation. (Capability unit IIs–5)

Princeton fine sandy loam, 2 to 6 percent slopes (PrB).—This gently undulating soil is on short slopes and broad ridgetops. It has the profile described as representative for the series. The areas are irregularly shaped and range in size from 3 acres to more than 40 acres.

Included in mapping are areas where the plow layer is a mixture of the original surface layer and a moderate amount of the dark-brown loam or sandy clay loam subsoil. Also included are small areas of nearly level soils and some severely eroded soils. Ayrshire soils are in a few small, low areas between ridges. A few areas of soils that have a loam surface layer are also included.

Runoff is slow, and erosion is the main hazard. If this soil is properly managed and erosion is controlled, it is suited to all crops common in the county and to such specialty crops as melons. It is suited to woodland and well suited to such deep-rooted trees as black walnut. This soil is suited to irrigation. (Capability unit IIe–11)

Princeton fine sandy loam, 6 to 12 percent slopes (PrC).—This rolling soil is on areas that resemble dunes. In some areas the surface layer consists of a mixture of the original surface layer and a moderate amount of the dark-brown sandy clay loam subsoil.

Included in mapping are a few small areas of soils that have a loam surface layer. In some severely eroded areas

the sandy clay loam subsoil is exposed at the surface. A few small areas of somewhat poorly drained soils are at the base of some slopes and in low swales between ridges. Also included are soils that have bands of fine sandy loam and sandy clay loam in the subsoil and a few areas of moderately steep soils.

Runoff is medium. Erosion is the major hazard in use and management of this soil. If the soil is properly managed and erosion is controlled, it is suited to all crops common in the county and to such specialty crops as melons. It is suited to woodland and is well suited to such deep-rooted trees as black walnut. (Capability unit IIIe–15)

Quarries

Quarries (Qu) (fig. 12) are in the southeastern part of the county. They are mainly in the area near Flatrock River between St. Paul and Flat Rock, where depth to limestone is relatively shallow. There are several small abandoned quarries. There are a few larger quarries now in operation. Some of the limestone is crushed fine for farm use. Limestone is also crushed and used as aggregate in concrete and for road surfacing. A small amount is quarried for use as building stone.

Some abandoned pits have filled with water and are suitable for being stocked with fish and developed for wildlife. The shrubs and other woody plants growing in old spoil areas provide habitat for wildlife. (Capability unit VIIIs–2)

Randolph Series

The Randolph series consists of moderately deep, somewhat poorly drained soils. These soils formed in a thin layer of glacial drift and are underlain by limestone bedrock at a depth of 24 to 42 inches. They are nearly level and are on terraces and uplands. These soils formed under a hardwood vegetation.

In a representative profile, the surface layer is about 7 inches of dark grayish-brown silt loam underlain by about 2 inches of grayish-brown silt loam. The subsoil is about 18 inches thick. The upper 14 inches is firm, grayish-brown or brown silty clay loam that has yellowish-brown, dark-brown, and pale-brown mottles. The lower 4 inches is firm, dark-brown clay that has dark reddish-brown and yellowish-brown mottles. The underlying limestone bedrock is at a depth of about 27 inches.

Randolph soils have moderately slow permeability. They have a low to moderate available moisture capacity and are naturally low in organic-matter content. The surface layer is medium acid or slightly acid unless it has been limed. These soils are somewhat droughty during long dry seasons. Excessive wetness is the main limitation

e solid bedrock. In most
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Wetness is the main limita-
rops common in the county
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s, and small grains. This
Because of the shallowness
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ty unit IIIw–7)

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he surface layer is about 14
7 inches is very dark gray,
k. The subsoil is about 34
hes is firm, dark-gray clay
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inches is firm, gray sandy
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reous sand and some silt.
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management of these soils.
irface during wet weather,
wing periods of high rain-
ps.
Rensselaer clay loam, in a
and 150 feet west of the
11 N., R. 5 E.

gray (10YR 3/1) clay loam;
ar structure; firm when moist;
1- to 3-millimeter wormholes
tral; abrupt, smooth boundary.
YR 2/1) clay loam; moderate,
blocky structure; firm when
(10YR 2/1), organic films on
to 3-millimeter wormholes and
0YR 2/1) worm casts; many
smooth boundary.
gray (N 4/0) clay loam; com-
t, olive-brown (2.5Y 4/4) and
R 5/6 and 10YR 5/8) mottles;
ic structure breaking to mod-
ular blocky; firm when moist;
ay films continuous on faces of
llimeter voids and wormholes;
th boundary.
-gray (10YR 4/1) clay loam;
inct, light olive-brown (2.5Y
llowish-brown (10YR 5/4 and
, coarse, prismatic structure
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moist; dark-gray (N 4/0) clay
aces of peds; few 1- to 4-milli-
mholes; neutral; clear, smooth

N 5/0) light sandy clay loam;
rown (2.5Y 5/4) and yellow-
/4 and 5/6) mottles; weak,
blocky structure; firm when

2, T. 13 N.,

avelly loam;
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avelly loam;
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YR 4/4) and
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Ross soils have a high available moisture capacity and are moderately permeable. They are high in organic-matter content and are neutral in reaction. They are subject to flooding during winter and early in spring. Ross soils are used mainly for crops, but a few areas that are irregularly dissected by meandering stream channels are used for permanent pasture or trees.

Representative profile of Ross silt loam, in a cultivated field 30 feet north and 50 feet west of the southeast corner of SW¼ sec. 31, T. 12 N., R. 6 E.

Ap—0 to 8 inches, very dark brown (10YR 2/2) silt loam, very dark grayish brown (10YR 3/2) when crushed; weak, fine, granular structure; friable when moist; several very dark brown (10YR 2/2) worm casts; neutral; abrupt, smooth boundary.

A12—8 to 17 inches, very dark brown (10YR 2/2) silt loam,

A13—19 to 27 inches, dark-brown (10YR 3/3) gravelly loam; moderate, medium, subangular blocky structure; slightly firm when moist; very dark grayish-brown (10YR 3/2) organic coatings on some faces of peds and on pebbles; common ½- to 1-inch pebbles; calcareous; moderately alkaline; clear, wavy boundary.

A14—27 to 30 inches, very dark grayish-brown (10YR 3/2) gravelly loam; massive; very friable when moist; dark-brown (7.5YR 3/2) organic coatings on pebbles; calcareous; moderately alkaline; abrupt, broken boundary.

C—30 to 72 inches, loose, stratified, moderately alkaline, calcareous gravel and sand.

The solum ranges from 24 to 36 inches in thickness but is mainly 24 to 30 inches thick. The A horizon is dark brown (7.5YR 3/2 or 10YR 3/3), very dark brown (10YR 2/2), or very dark grayish brown (10YR 3/2). The A12, A13, and A14 horizons are loam, gravelly loam, or sandy loam.

Ross soil, moderately deep variant, Genesee soil, sandy variant, Ross soils, and Genesee soils occupy similar terrain. The Ross soil, moderately deep variant, differs from the Genesee soil, sandy variant, in having a higher percentage of pebbles throughout the profile and in having a finer textured solum and gravelly underlying material. It is coarser textured and darker colored than Genesee soils of the regular series. It is thinner and coarser textured than the Ross soils. Ross soils, moderately deep variant, is associated on the landscape with the well-drained Ross soils, the moderately well drained Medway soils, and the very poorly drained Saranac and Westland soils.

Ross loam, moderately deep variant (0 to 2 percent slopes) (Rs).—This soil is on the flood plains.

About 30 percent of the soil areas have loose gravel and sand at a depth of less than 24 inches, and in a few areas the loose gravel is in the plow layer. A few small areas of Ross soils are included in mapping. There are a few small areas of Shoals, Saranac, and Westland soils included in old stream meanders.

Runoff is slow. This soil is subject to flooding during winter and early in spring, except in areas protected by levees. It is droughty at some time during a normal growing season. This soil is suited to annual row crops common in the county, but crops that are somewhat drought-tolerant, such as grain sorghum, are better suited than corn. Fall-seeded small grains are likely to be damaged by winter and spring flooding unless the area is protected or flooding is only occasional. (Capability unit IIs–6)

Saranac Series

The Saranac series consists of deep, very poorly drained soils. These soils formed in neutral or calcareous, moderately fine textured and fine textured alluvium. They are in some of the old meander channels on flood plains and on some nearly level flood plains where the water table is high. The native vegetation was water-tolerant hardwoods and shrubs and some grasses.

In a representative profile, the surface layer is about 11 inches of very dark gray silty clay loam. The subsoil is about 28 inches thick. The upper 8 inches is firm, dark-gray silty clay loam; the middle 7 inches is very firm, dark-gray light silty clay, and the lower 13 inches is very firm, gray silty clay. The underlying material, at a depth of about 39 inches, consists of sand and gravel and layers of silt and clay.

The Saranac soils are slowly permeable and have a high available moisture capacity. The surface layer is naturally neutral, and the soils are naturally high in organic-matter content. The main limitation is excessive wetness. These soils are subject to flooding during winter and early in spring and to occasional flooding during the growing season. They are used mainly for crops, but some narrow, undrained, cutoff old stream meanders are wooded. Some areas of old meanders have water ponded on them for long periods following flooding or rains.

Representative profile of Saranac silty clay loam, in a cultivated field 200 feet east of the bridge across Brandywine Creek and 30 feet south of the road in the NW¼SE¼ sec. 29, T 14 N., R. 7 E.

Ap—0 to 7 inches, very dark gray (10YR 3/1) silty clay loam; weak, fine, granular structure; firm when moist; abundant roots; neutral; abrupt, smooth boundary.

A12—7 to 11 inches, very dark gray (10YR 3/1) silty clay loam; few, fine, faint, dark yellowish-brown (10YR 3/4) mottles; moderate, fine, subangular blocky structure; firm when moist; very dark gray (N 3/0) organic films on some faces of peds; abundant roots; neutral; clear, smooth boundary.

B21g—11 to 19 inches, dark-gray (10YR 4/1) silty clay loam; common, medium, distinct, yellowish-brown (10YR 5/4) and dark grayish-brown (2.5Y 4/2) mottles; moderate, medium, subangular blocky structure and some angular blocky; firm when moist; neutral; clear, smooth boundary.

B22g—19 to 26 inches, dark-gray (N 4/0) light silty clay; common, medium, distinct, yellowish-brown (10YR 5/4) and dark grayish-brown (2.5Y 4/2) mottles; moderate, medium, angular blocky structure; very firm when moist; neutral; clear, smooth boundary.

B23g—26 to 39 inches, gray (N 5/0) light silty clay; common, medium, distinct, dark grayish-brown (2.5Y 4/2) and yellowish-brown (10YR 5/4) mottles; weak, coarse, subangular blocky structure; very firm when moist; calcareous; mildly alkaline; clear, smooth boundary.

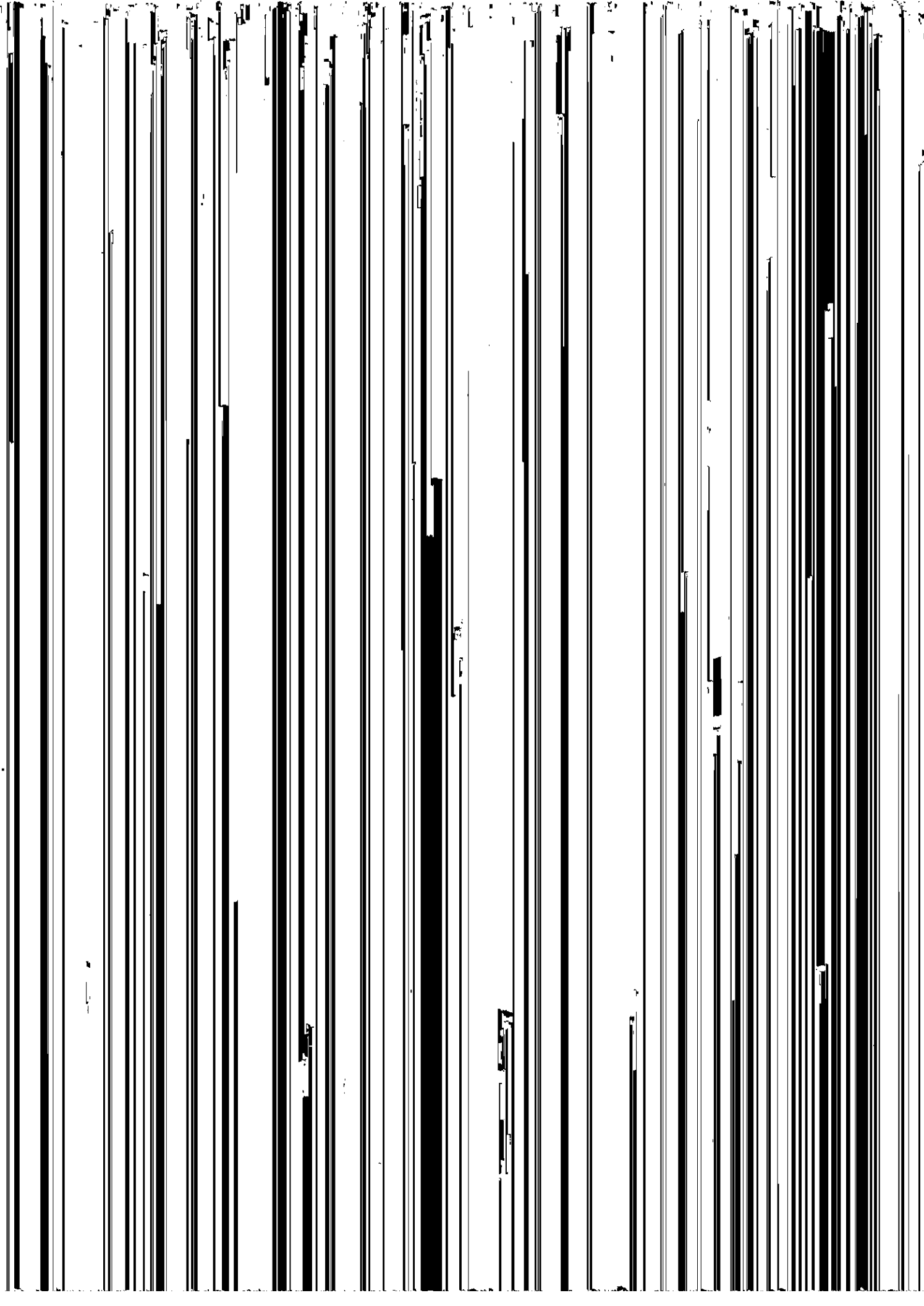
Cg—39 to 50 inches, gray (10YR 5/1), stratified sand and gravel and some layers of silt and clay; moderately alkaline; calcareous.

The solum ranges from 30 to 50 inches in thickness. The Ap horizon is very dark grayish brown (10YR 3/2), very dark gray (10YR 3/1), or very dark brown (10YR 2/2). The A12 horizon is very dark gray (10YR 3/1) or black (10YR 2/1). Total thickness of the A horizon is 10 to 18 inches. The B horizon is dark gray (10YR 4/1 and N 4/0), gray (10YR 5/1 and N 5/0), or grayish brown (2.5Y 5/2 and 10YR 5/2). The B horizon is stratified, and the texture is silty clay loam, silty clay, clay loam, and clay. The C horizon is stratified, and the layers are silty clay loam, silt, sand, gravel, silty clay, or clay.

Saranac, Westland, Rensselaer, and Brookston soils have similar drainage. The Saranac soils have a finer textured subsoil than Westland, Rensselaer, and Brookston soils. Saranac soils have a lower percentage of pebbles throughout the profile than Westland soils, which are underlain by loose gravel and sand. They have a lower percentage of sand throughout the profile than Rensselaer soils, which are underlain by stratified sand and silt. The very poorly drained Saranac soils are associated on the landscape with the somewhat poorly drained Shoals soils, the moderately well drained Medway and Eel soils, and the well-drained Ross and Genesee soils.

Saranac silty clay loam (0 to 2 percent slopes) (Sa).—This nearly level, very poorly drained soil is in some of the old stream meanders and on some flood plains that have a high water table.

Included in mapping are small areas of soils that have a silt loam surface layer. Some of the soils in the old stream meanders have snail shells in the profile and are calcareous throughout. In some areas there are pebbles in the profile. Also included are small areas of Shoals soils.



very dark grayish-brown (10YR 3/2) worm casts;

Saranac soils, the moderately well drained Eel soils, and the

material and overlie stratified sand and gravel. Depth to the loose, calcareous sand and gravel is 40 to 60 inches. These soils are on the outwash plains and stream terraces. The native vegetation was hardwood forests.

In a representative profile, the surface layer is about 8 inches of dark grayish-brown loam underlain by 3 inches of grayish-brown loam mottled with yellowish brown and strong brown. The subsoil is about 37 inches thick. The uppermost 6 inches is friable, brown clay loam mottled with grayish brown, strong brown, and pale brown; the next 15 inches is firm, grayish-brown or dark-gray clay loam mottled with yellowish brown, strong brown, grayish brown, and olive brown; the next 6 inches is firm, dark-gray gravelly clay loam mottled with yellowish brown and brown; and the lower 10 inches is moderately alkaline, friable, grayish-brown gravelly clay loam mottled with yellowish brown. The underlying material is at a depth of 48 inches and consists of calcareous, stratified, loose sand and gravel.

Permeability is moderate, and the available moisture capacity is high. The surface layer is medium acid unless it has been limed. These soils are naturally low in organic-matter content. During winter and early in spring the water table is commonly near the surface. These soils are mainly used for crops.

Representative profile of Sleeth loam, in a cultivated field 245 feet south and 80 feet east of the northwest corner of the NE¼NW¼ sec. 28, T. 14 N., R. 7 E.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) loam; weak, fine, granular structure; friable; neutral; abrupt, smooth boundary.

A2—8 to 11 inches, grayish-brown (10YR 5/2) loam; common, medium, distinct, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles; weak, medium, granular structure; friable when moist; neutral; clear, smooth boundary.

B1—11 to 17 inches, brown (10YR 5/3) light clay loam; common, medium, distinct, grayish-brown (10YR 5/2), strong-brown (7.5YR 5/6), and pale-brown (10YR 6/3) mottles; weak, medium, subangular blocky structure; friable when moist; slightly acid; clear, smooth boundary.

B21tg—17 to 23 inches, grayish-brown (10YR 5/2) clay loam; common, medium, distinct, yellowish-brown (10YR 5/6) and olive-brown (2.5Y 4/4) mottles; weak, coarse, prismatic structure breaking to moderate, medium, subangular and angular blocky; firm when moist; thin dark-gray (10YR 4/1) clay films continuous on most faces of peds; medium acid; clear, wavy boundary.

B22tg—23 to 32 inches, dark-gray (10YR 4/1) clay loam; common, medium, distinct, yellowish-brown (10YR 5/6), strong-brown (7.5YR 5/6), and grayish-brown (10YR 5/2) mottles; weak, coarse, prismatic structure breaking to moderate, medium, subangular blocky; firm when moist; about 10 percent fine gravel; thin dark-gray (10YR 4/1) clay films continuous on all faces of peds and on pebbles; medium acid; clear, wavy boundary.

B23tg—32 to 38 inches, dark-gray (10YR 4/1) gravelly clay loam; common, medium, distinct, yellowish-brown (10YR 5/6) and brown (10YR 4/3) mottles; moderate, medium to coarse, subangular blocky structure; dark-gray (10YR 4/1) clay films continuous on faces of peds and on pebbles; firm when moist; neutral; gradual, wavy boundary.

B3—38 to 48 inches, grayish-brown (10YR 5/2) gravelly clay loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium to coarse, subangular blocky structure; friable when moist; very dark gray (10YR 3/1) clay films on gravel faces and on some peds; few decomposing dolomitic rocks; calcareous; moderately alkaline; abrupt, wavy boundary.

IIC—48 to 55 inches, grayish-brown (10YR 5/2) gravel and sand; single grain; loose; calcareous; moderately alkaline.

The solum ranges from 40 to 60 inches thick. The Ap horizon is dark grayish brown (10YR 4/2), grayish brown (10YR 5/2), or light brownish gray (10YR 6/2). The A2 horizon is light brownish gray (10YR 6/2) or grayish brown (10YR 5/2). The A2 horizon is lacking in some areas. The B2 horizon is silty clay loam, clay loam, or gravelly clay loam. The B2 horizon is mainly dark gray (10YR 4/1), dark grayish brown (10YR 4/2 and 2.5Y 4/2), grayish brown (10YR 5/2 and 2.5Y 5/2), or brown (10YR 5/3). The moderately alkaline B3 horizon is at a depth ranging from 34 to 44 inches. It is 8 to 18 inches thick.

Sleeth, Crosby, Whitaker, and Ayrshire soils are similar in drainage characteristics and are on similar terrain. Sleeth soils have more gravel in the lower part of the subsoil than Crosby soils, which are underlain by loam till. They have more gravel in the solum than Whitaker soils, which are underlain by stratified silt and sand and which lack calcareous gravelly clay loam in the lower part of the subsoil. Sleeth soils are not so sandy as Ayrshire soils, which contain no gravel and which are underlain by fine sand and silt. The somewhat poorly drained Sleeth soils are closely associated with the well-drained Ockley and Fox soils and the very poorly drained Westland soils.

Sleeth loam (0 to 2 percent slopes) (Sm).—This nearly level, somewhat poorly drained soil is on outwash and stream terraces and is underlain by stratified sand and gravel.

Included in mapping are small areas of Westland soils in the narrow, elongated depressions. In a few places there are small areas of soils included which are mottled at a depth of 18 to 30 inches. Also included are a few small areas of Ockley soils. In places there are small pockets of loose gravel at a depth of less than 42 inches.

Runoff is slow. The water table is near the surface early in spring. Wetness is the main limitation. If adequately drained and properly managed, this soil is suited to all crops common in the county. The main crops are corn and soybeans. (Capability unit IIw-2)

Westland Series

The Westland series consists of deep, very poorly drained soils. These soils formed in loamy outwash material and are underlain by loose sand and gravel at a depth to 42 to 60 inches. They are in slightly depressed swales on the outwash plains and stream terraces. The native vegetation was water-tolerant hardwoods and shrubs and some sedges and grasses.

In a representative profile, the surface layer is about 13 inches of clay loam. The upper part is very dark gray, and the lower part is black. The subsoil is about 32 inches thick. The upper 13 inches is firm, dark-gray clay loam mottled with olive brown and yellowish brown; the middle 14 inches is firm, gray clay loam mottled with olive brown and yellowish brown; the lower part is firm, gray gravelly clay loam mottled with yellowish brown. The underlying material is light brownish-gray and gray, loose, stratified gravel and sand.

Westland soils are naturally high in organic-matter content. The surface layer is naturally slightly acid or neutral, and lime is generally not needed. These soils have a high available moisture capacity and slow permeability. The main limitation to use and management of

these soils is excessive wetness. The water table is near the surface during wet weather. Surface water ponds following periods of high rainfall. Most areas are used for crops, but a few small areas are wooded.

Representative profile of Westland clay loam, in a cultivated field 240 feet east and 160 feet north of the southwest corner of sec. 11, T. 13 N., R. 5 E.

Ap—0 to 7 in[redacted]

soils that have lighter colored alluvium deposited on the surface.

Wetness is the main limitation. Runoff is slow or very slow. Surface water ponds in some areas during seasons of high rainfall. If properly managed and adequately drained, this soil is suited to all crops common in the county. If worked when too wet, this soil is subject to [redacted]

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soil groups within the subclasses.
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Mapping Units." The capability
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ABILITY UNIT I–1

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nt. These
ways and

minimum tillage, help to control erosion and runoff. Without mechanical controls, fewer years of row crops and more years of close-growing crops are needed to protect the soil. Several combinations of cropping systems are suited to this soil.

This soil is suited to woodland and is ideally suited to such deep-rooted trees as black walnut. Other major trees are tulip-poplar, wild cherry, [illegible]

Erosion is a hazard, and wetness is a limitation to farming. The maintenance of organic-matter content and fertility is needed in the use and management of these soils for crops.

Crop residue, winter cover crops, green-manure crops, and minimum tillage can be used to help control erosion and maintain desirable organic-matter content and good soil tilth. Water control is needed for maximum efficiency

oils are suited to woodland. They are ideally such deep-rooted trees as black walnut, Osage- d black locust.

CAPABILITY UNIT IIIe–1

nit consists of deep, well-drained, medium- nd moderately fine textured, gently sloping and ls of the Miami and Parke series.

oils have low organic-matter content and a high moisture capacity. The moderately eroded soils erate fertility, and the severely eroded soils fertility. Permeability is moderate or moder- . Runoff is medium to rapid. The severely ls have poor tilth, and the plow layer dries out d puddles if worked when wet. Tilth of the y eroded soils is good. The main management control of erosion and maintenance of a desir- of organic-matter content and fertility.

this unit are suited to crops commonly grown nty. Corn, soybeans, small grains, and legume- are the main crops. These soils are also suited

sidue, winter cover crops, and spring plowing d to help maintain organic-matter content and nd to help control erosion. Several combinations g systems that help to control erosion are suit- e on these soils. Where suitable, such mechani- es as contour farming also help to control d allow more years of row crop in a cropping rassed waterways are needed in areas where er concentrates.

oils are suited to woodland. The main trees upland oaks, black walnut, tulip-poplar, and y.

CAPABILITY UNIT IIIe–8

it consists of gently sloping, moderately deep, ed Milton silt loam, 1 to 6 percent slopes. This d in thin glacial drift over limestone bedrock. he underlying bedrock is 24 to 42 inches.

has moderate fertility and low organic-matter he available moisture capacity is low to mod- permeability is moderate. The surface layer is nedium acid to slightly acid. Runoff is medium. management needs are control of erosion and ce of organic-matter content, tilth, and fertility. droughty during dry seasons.

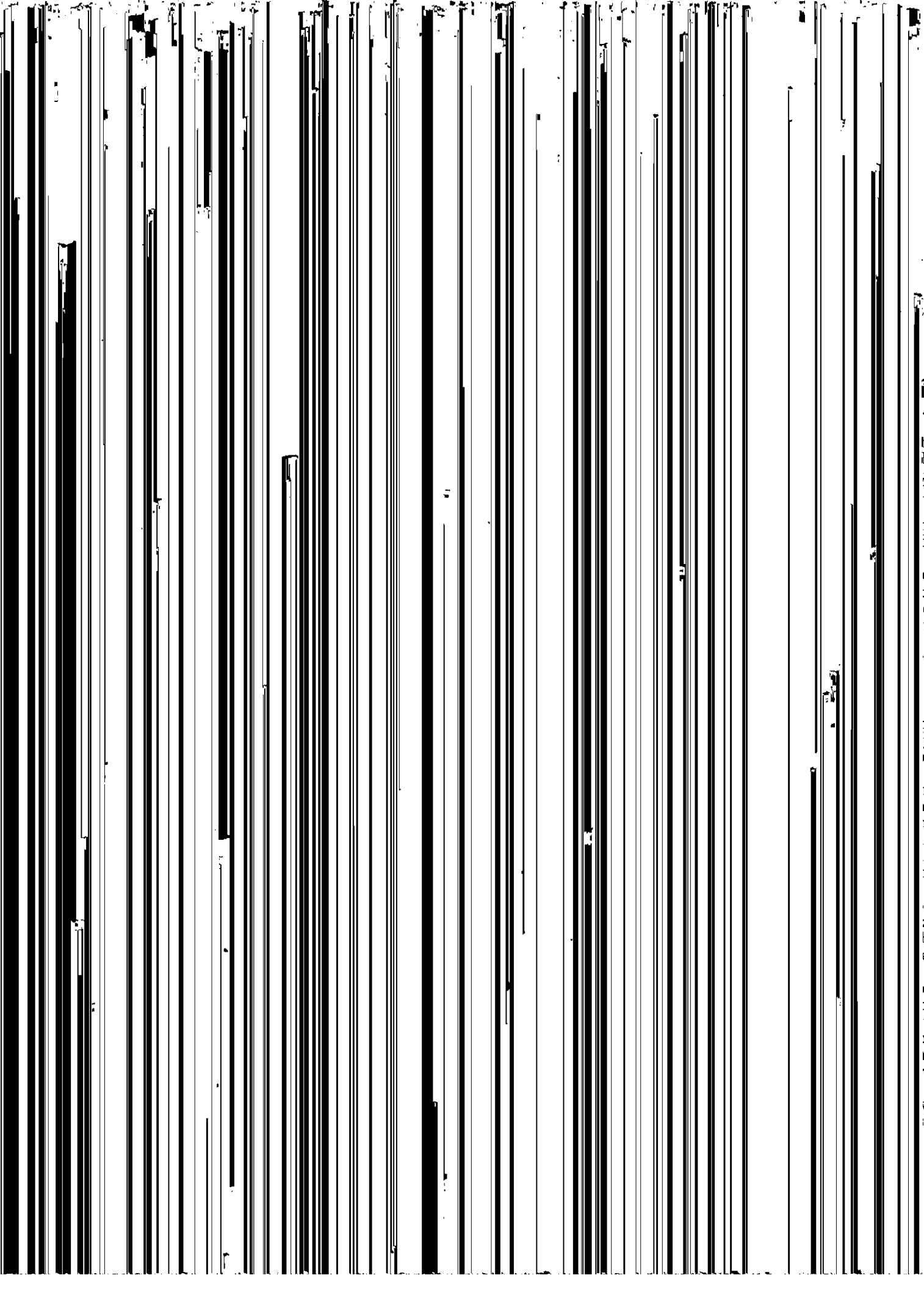
l is suited to all crops common in the county. l crops, such as wheat, that need moisture ie season but have low moisture requirements mmer, are well suited to this soil.

fferent cropping systems that help to control suited to this soil. Grass and legumes can be ie rotation to help maintain organic-matter d tilth. Crop residue needs to be returned to . These practices, along with minimum tillage ir plowing, help to control erosion. Slopes are rt and irregular.

is suited to woodland, and the main trees are s, Osage-orange, and black locust.

CAPABILITY UNIT IIIe–9

it consists of moderately deep, well-drained, ping and sloping soils of the Fox series. The ping soils are moderately fine textured and



y and organic-matter content are low. The eroded soils have poor tilth, and the surface ds to become hard and cloddy upon drying if vhen wet. The available moisture capacity is permeability is moderate and moderately slow. rapid. All soils in this unit are subject to severe f cleared of trees or cultivated. Fertility needs roved in areas used for pasture.

oils are not suited to cultivated crops. They are d to pasture and hay. Grass and mixtures of d grass and clover and grass are well suited.

oils are suited to woodland. The main trees are ks, tulip-poplar, and sugar maple.

CAPABILITY UNIT VIIe–2

it consists of well-drained, steep and very steep nd Hennepin soils. Some areas are shallow over bedrock. These soils are medium textured and roded. Runoff is rapid or very rapid.

ls in this unit have low fertility and a low to available moisture capacity. The uneroded sur- is high in organic-matter content. The main nt need is control of erosion.

oils are suited to woodland, wildlife habitat, or al uses. They are suited to limited pasture.

ent pasture helps to control erosion and to im- er infiltration. Pasture renovation and contour o helps to control erosion. Such practices as these le for areas where slopes are 18 to 25 percent. ns of fertilizer generally improve the quality of pasture.

oils are suited to woodland. The Hennepin soils to such trees as tulip-poplar, upland oaks, and ple. The main trees on the Corydon soils are oaks.

CAPABILITY UNIT VIIs–1

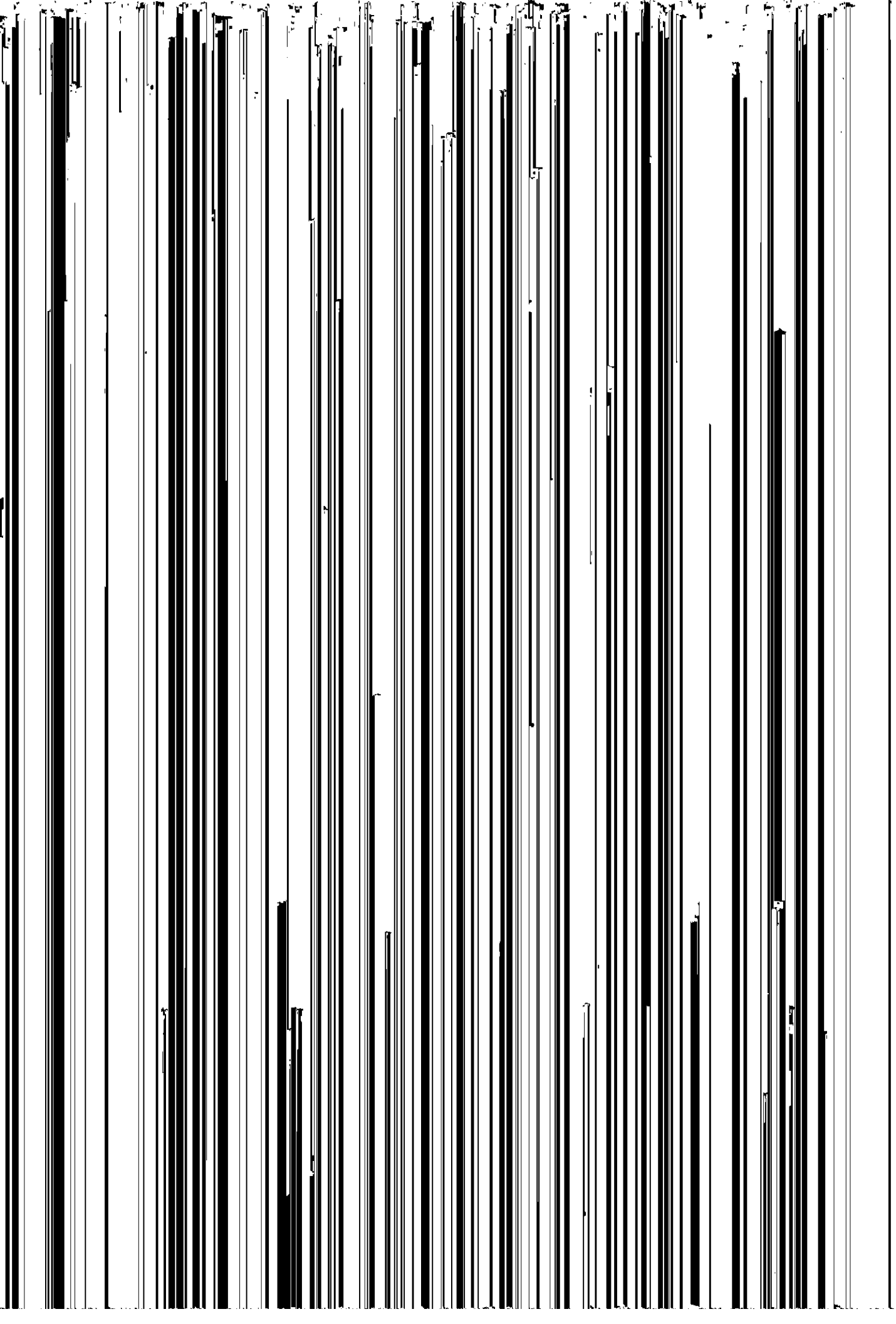
it consists of shallow, steep, well-drained Rod- lly loam, 18 to 35 percent slopes. This soil is on ice breaks. The surface layer is gravelly loam. vel and sand are at a depth of less than 15

l has a very low available moisture capacity. surfaces are high in organic-matter content. ity is moderately rapid. This soil is droughty. apid. Erosion is a hazard.

l is suited to woodland, wildlife habitat, rec- ises, and limited pasture. It is suited to early t has limited use for summer pasture. Perma- ation is required to control erosion. Areas in d to be protected from grazing. The main n are chinkapin oaks, Osage-orange, or other d trees that are somewhat drought tolerant.

CAPABILITY UNIT VIIIs–2

t consists of Gravel pits and Quarries. These us land types have some use for wildlife hab- re not generally suited to the production of without major reclamation. Some of the aban- vel pits and Quarries are being used for fish- he surrounding areas are used for recreation. iscellaneous land types are not suited to wood- me trees grow in cracks between stones and in e there are small amounts of soil.



two levels of management

ı columns B are yields to be expected under
r that the crop ordinarily is not grown]

	Wheat		Legume-grass hay mixture	
B	A	B	A	B
Bu.	*Bu.*	*Bu.*	*Tons*	*Tons*
40	30	43	2. 5	4. 5
45	30	53	3. 0	5. 0
45	30	50	3. 0	5. 0
40	30	45	3. 0	5. 0
40	32	43	2. 5	4. 5
43	32	45	2. 5	4. 0
30	30	50	2. 5	4. 5
30	30	45	2. 5	4. 5
28	25	35	2. 5	4. 0
20	20	30	2. 0	3. 5
40	35	50	3. 0	4. 5
33	25	35	2. 5	3. 5
24	20	30	2. 5	3. 5
45	20	45	2. 5	5. 0
25			2. 0	3. 0
45	20	40	2. 5	5. 0
40				
45	36	55	3. 0	5. 5
40	32	45	2. 5	5. 0
45	32	40	2. 5	4. 5
45	35	45	2. 5	5. 0
35	28	38	2. 5	4. 5
30	25	35	2. 0	3. 5
35	30	38	2. 5	4. 5
30	20	33	2. 5	4. 0
	15	25	2. 0	3. 0
35	30	40	3. 0	4. 0
40	25	35	2. 5	4. 0
33	20	35	2. 5	4. 0
25	18	30	2. 5	3. 5
30	30	45	2. 5	4. 5
30	30	45	2. 5	4. 0
45	37	55	3. 5	5. 5
35	30	40	3. 0	5. 0
28	25	35	2. 5	4. 0
30	30	45	3. 0	4. 5
28	30	43	3. 0	4. 0
25	25	35	2. 5	3. 0
35	25	35	2. 5	3. 5
45	35	53	3. 0	5. 5
45	32	40	3. 0	4. 5
28	25	35	2. 5	3. 5
38			2. 0	3. 0
35	20	35	2. 5	3. 5
38	15	30	2. 0	3. 0
45	30	50	3. 0	5. 5
50	30	55	3. 0	5. 5
45	30	55	3. 0	5. 5
45	30	50	3. 0	5. 5

ws the growth of trees, and prevents
mall, level and gently sloping wooded
ıred for crops. There are a few wooded
that have a good stand of high quality
tulip-poplar, and walnut.

3.—*Suitability of soils for wildlife habitat development*

pits (Gp) and Quarries (Qu), because these miscellaneous land types have variable properties]

Openland wildlife	Woodland wildlife	Wetland wildlife
ted	Suited: somewhat poorly drained; poorly suited to coniferous woodland plants; suited to grasses and legumes.	Suited: somewhat poorly drained; suited to wetland food and cover plants; fair for shallow-water developments and excavated ponds.
uited: very poorly ed, depressional soil; able for grain and rops; poorly suited to s and legumes and to erbaceous upland	Suited: very poorly drained	Well suited.
d: erosion hazard; able for grain and rops and grasses and es; poorly suited to erbaceous plants and ood plants; shallow lrock.	Unsuited: erosion hazard; very poorly suited to hardwood woodland plants; poorly suited to coniferous woodland plants.	Unsuited: well-drained, steep soil; unsuited to wetland food and cover plants and to shallow-water developments and excavated ponds.
ted	Suited: somewhat poorly drained; suited to hardwood woody plants; poorly suited to coniferous plants.	Suited where slopes are 0 to 2 percent: somewhat poorly drained; suited to wetland food and cover plants, shallow-water developments, and excavated ponds; fluctuating water table. Poorly suited where slopes are 2 to 6 percent: somewhat poorly drained; poorly suited to shallow-water developments and wetland food and cover plants.
ted	Well suited	Unsuited: moderately well drained; poorly suited or unsuited to wetland food and cover plants, shallow-water developments, and excavated ponds.
ted	Well suited	Unsuited: well drained; unsuited to wetland food and cover plants and to shallow-water developments and excavated ponds.
ted	Well suited	Unsuited: well drained; unsuited to wetland food and cover plants and to shallow-water developments and excavated ponds.
ed	Well suited	Unsuited: well drained; unsuited to wetland food and cover plants and to excavated ponds and shallow-water developments.
erosion hazard; steep oorly suited to grain ed crops, grasses and es; well suited to ood woodland plants.	Suited: erosion hazard; steep soil; poorly suited to coniferous woodland plants; suited to grasses and legumes.	Unsuited: steep soil; unsuited to wetland food and cover plants, shallow-water developments, and excavated ponds.
uited: very poorly d; unsuitable for grain ed crops; poorly suited sses and legumes.	Well suited	Well suited.

TABLE 3.—*Suitability of soils for wildlife habitat development*—Continued

Soil series and map symbols	Openland wildlife	Woodland wildlife	Wetland wildlife
Linwood: Lm	Unsuited: organic soil; high water table; unsuitable for grain and seed crops and grasses and legumes.	Unsuited: organic soil; high water table; unsuitable for hardwood woodland plants and for coniferous plants.	Suited: well suited to shallow-water developments; suited to wetland food and cover plants.
Martinsville: MaA, MaB2	Well suited	Well suited: poorly suited to coniferous woody plants.	Unsuited: stratified silt and sand underlies soil profile; unsuitable for wetland food and cover plants and shallow-water developments.
Medway: Me	Well suited	Well suited	Poorly suited: poorly suited to wetland food and cover plants and to shallow-water developments.
Miami: MlB2, MlC2, MlD2, MmB3, MmC3, MmD3, MrB.	Well suited (suited on severely eroded soils).	Well suited (suited on severely eroded soils).	Unsuited: sloping soil; unsuitable for wetland food and cover plants and shallow-water developments.
Millsdale: Ms	Poorly suited: poor drainage; unsuitable for grain and seed crops; poorly suited to grasses and legumes.	Well suited	Suited: well suited to wetland food and cover plants and to shallow-water developments; unsuitable for ponds because soil is shallow over limestone.
Milton: MtB	Well suited	Well suited	Unsuited: shallow to bedrock; unsuited to wetland food and cover plants and to shallow-water developments.
Negley: NeD2, NeE	Well suited	Well suited	Unsuited: well drained; coarse textured in subsoil and below; unsuited to wetland food and cover plants and to shallow-water developments and ponds.
Nineveh: NnA, NnB	Well suited	Well suited	Unsuited: shallow over gravel; unsuited to wetland food and cover plants and to shallow-water developments.
Ockley: OcA	Well suited	Well suited	Unsuited: shallow over gravel; unsuited to wetland food and cover plants and to shallow-water developments.
Parke: PaB2, PaC2	Well suited	Well suited	Unsuited: well drained; coarse textured in subsoil and below; unsuited to wetland food and cover plants, shallow-water developments, and ponds.
Princeton: PrA, PrB, PrC	Well suited	Well suited	Unsuited: well drained; coarse textured in subsoil and below; sloping soil; unsuited to wetland food and cover plants, shallow-water developments, and ponds.

d

Wetland wildlife

d: shallow over bedrock; ted to wetland food and ver plants and shallow- ter developments; unsuit- le for ponds.

suited.

ıited: steep slopes; ero- n hazard; shallow over ıvel; unsuited to wetland)d and cover plants, allow-water developments, d ponds.

ıited: well drained; un- ited to wetland food and ver plants, shallow-water velopments, and ponds.

ıited: well drained; allow over sand and gravel; suited to wetland food and ver plants, shallow-water velopments, and ponds.

ed: very poorly drained; ited to wetland food and ver plants: well suited to allow-water developments.

suited.

ed: somewhat poorly ained; subject to flooding; ited to wetland food and ver plants; poorly suited to nds.

ed: somewhat poorly ained; suited to wetland od and cover plants and to allow-water developments.

suited.

ed: somewhat poorly ained; suited to wetland od and cover plants, shal- w-water developments, and nds.

use planning. The location of Shelby County in relationship to centers of population and the resources of the county make it possible to develop some income-producing enterprises. The most likely enterprises are hunting areas, shooting preserves, improved picnic areas, and ponds and lakes for fishing and water sports. Already, several borrow pits made by excavating material for road fills on I–74 have been developed for fishing and swimming.

In table 4 the soils in Shelby County are rated according to their limitations for developing five kinds of recreational facilities. These are campsites for tents and trailers; picnic grounds, parks, and extensive play areas; playgrounds and athletic fields; paths and trails; and golf course fairways.

The ratings used in table 4 are slight, moderate, and severe. For a rating other than slight, the degree of limitation of the soil for developing a specific recreational facility is also given.

and soil features affecting recreational uses

ng unit in this series is made up of two or more kinds of soil. Because these v carefully the instructions for referring to other series appearing in the first and Quarries (Qu) because these land types have variable properties]

arks, lay	Playgrounds and athletic fields	Paths and trails	Golf course fairways
on- r dry	Moderate: seasonally high water table; slow to dry after rains.	Moderate: seasonally high water table; muddy when wet.	Moderate: slow to dry after rains; seasonally high water table.
g of le; pery	Severe: ponding of surface water; high water table; sticky and slippery when wet.	Severe: wet for long periods of time; sticky and slippery when wet.	Severe: subject to ponding; slow to dry after rains.
on al- ck.	Severe: steep slopes; stones on the surface; shallow over bedrock.	Severe: steep slopes; stones on the surface; shallow over bedrock.	Severe: steep slopes; stones on the surface; shallow over bedrock.
on- dry	Severe: seasonally high water table; slow to dry after rains; slow permeability.	Moderate: slow to dry after rains.	Moderate: slow to dry after rains.
es g	Moderate: subject to flooding, usually during winter or early in spring.	Moderate: subject to flooding, usually during winter or early in spring.	Moderate: subject to flooding, usually during winter or early in spring.
e it, e ope es; g	Slight where slope is 0 to 6 percent, moderate where slope is 6 to 12 percent, and severe where slope is 12 to 18 percent: subject to erosion on slopes; droughty during long dry season.	Slight where slope is 0 to 6 percent, moderate where slope is 6 to 12 percent, and severe where slope is 12 to 18 percent: subject to erosion on slopes.	Slight where slope is 0 to 6 percent, moderate where slope is 6 to 12 percent, and severe where slope is 12 to 18 percent: droughty during long dry season.

TABLE 4.—*Degree of limitations and soil features affecting recreational uses*—Continued

Soil series and map symbols	Campsites	Picnic grounds, parks, and extensive play areas	Playgrounds and athletic fields	Paths and trails	Golf course fairways
Genesee: Ge	Slight if area does not flood during season of use.	Slight if area does not flood during season of use.	Moderate: subject to flooding, usually during winter and early in spring.	Moderate: subject to flooding, usually during winter and early in spring.	Moderate: subject to flooding, usually during winter and early in spring.
Genesee series, sandy variant: Gn.	Slight if area does not flood during season of use.	Slight if area does not flood during season of use.	Moderate: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding, usually during winter and early in spring; somewhat droughty during long dry seasons.
Hennepin: HeE, HeF.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
Kokomo: Ko	Severe: subject to ponding; high water table; remains wet for long periods.	Severe: ponding of surface water; high water table; sticky and slippery when wet.	Severe: ponding of surface water; high water table; sticky and slippery when wet.	Severe: ponding of surface water; remains wet for long periods; slippery when wet.	Severe: ponding of surface water; remains wet for long periods.
Linwood: Lm	Severe: subject to ponding; high water table; remains wet for long periods.	Severe: subject to ponding; high water table.	Severe: subject to ponding; high water table.	Very severe: high water table; remains wet for long periods; soft when wet.	Severe: high water table; unstable material; surface does not remain smooth after freezing and thawing.
Martinsville: MaA, MaB2.	Slight	Slight	Slight	Slight	Slight.
Medway [1]: Me	Slight if area does not flood during season of use.	Slight if area does not flood during season of use.	Moderate: subject to flooding, usually during winter and early spring.	Moderate: subject to flooding; usually during winter and early in spring.	Moderate: subject to flooding.
*Miami: MlB2, MlC2, MlD2, MmB3, MmC3, MmD3, MrB. For limitations of the Crosby soils in MrB, see the Crosby series.	Slight where slope is 2 to 6 percent, moderate where slope is 6 to 12 percent.	Slight where slope is 2 to 6 percent, moderate where slope is 6 to 12 percent.	Moderate where slope is 2 to 6 percent, severe where slope is 6 to 12 percent: subject to erosion.	Moderate: 2 to 12 percent slopes; subject to erosion; eroded spots when wet.	Slight where slope is 2 to 6 percent, moderate where slope is 6 to 12 percent, and severe where slope is 12 to 18 percent: subject to erosion.
Millsdale: Ms	Severe: subject to ponding; high water table; remains wet for long periods.	Severe: subject to ponding; high water table.	Severe: subject to ponding; high water table.	Severe: subject to ponding of surface water; remains wet for long periods; slippery when wet.	Severe: subject to ponding of surface water; slow to dry after rains.
Milton: MtB	Slight	Slight	Slight	Slight	Slight to moderate: stones at depth of 24 to 42 inches.
Negley: NeD2, NeE.	Severe: slopes greater than 12 percent.	Severe: slopes greater than 12 percent.	Severe: slopes greater than 12 percent.	Severe: slopes greater than 12 percent.	Severe: slopes greater than 12 percent.
Nineveh: NnA, NnB.	Slight	Slight	Slight	Slight	Slight.

See footnote at end of table.

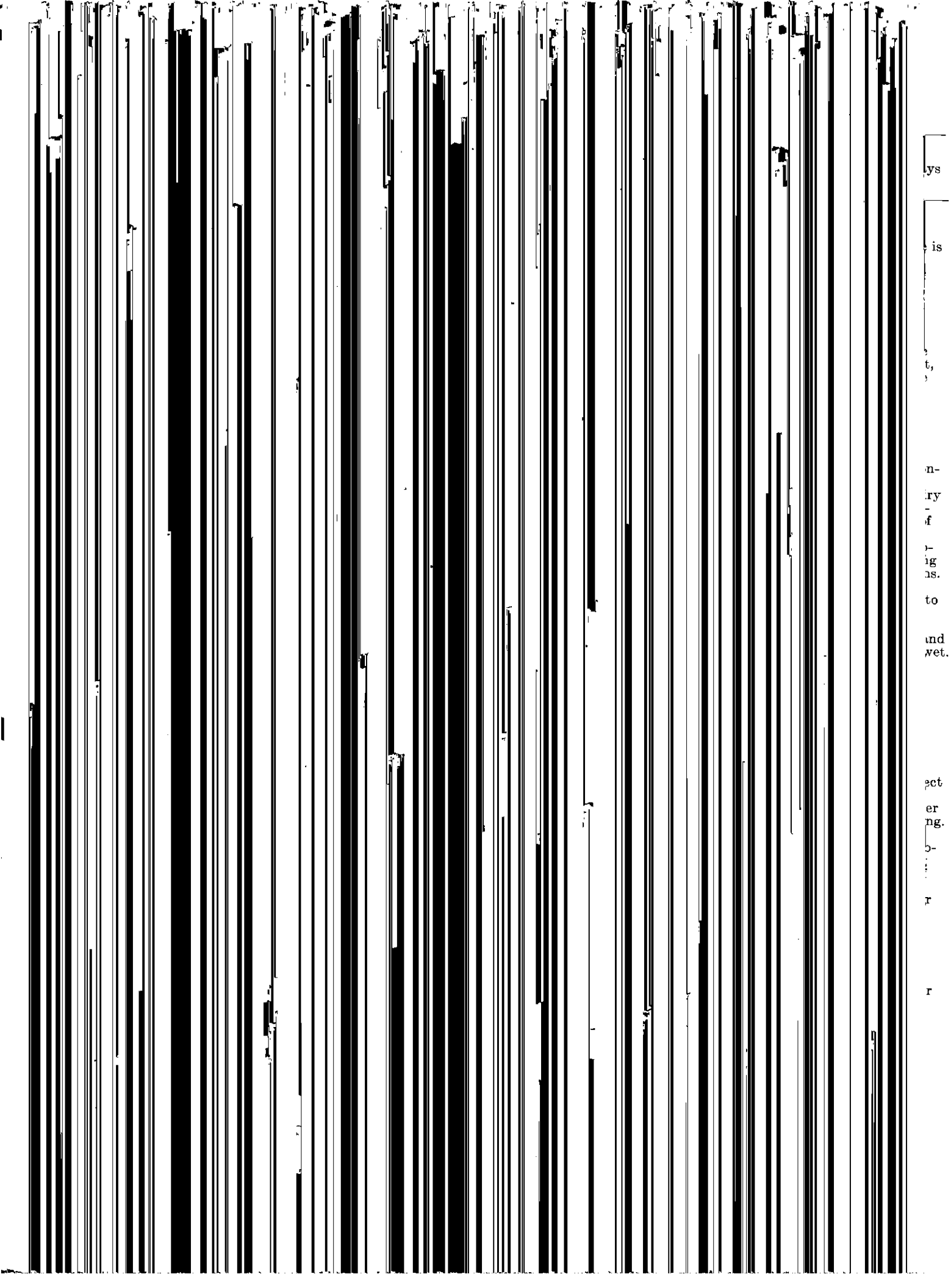


TABLE 4. *Degree of limitations and soil features affecting recreational uses*—Continued

Soil series and map symbols	Campsites	Picnic grounds, parks, and extensive play areas	Playgrounds and athletic fields	Paths and trails	Golf course fairways
Shoals [1]: Sh	Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding; high water table; slow to dry after rains.	Severe: subject to flooding; high water table; slow to dry after rains.	Moderate: subject to flooding.	Moderate: subject to flooding.
Sleeth: Sm	Moderate: seasonal high water table; slow to dry after rains.	Moderate: seasonal high water table; slow to dry after rains.	Moderate: seasonal high water table; slow to dry after rains.	Moderate: seasonal high water table; slow to dry after rains.	Moderate: slow to dry after rains.
*Westland: Wc, We. For Brookston part of We, see Brookston series.	Severe: subject to ponding; high water table; remains wet for long periods of time.	Severe: subject to ponding; high water table; sticky and slippery when wet.	Severe: subject to ponding; high water table; sticky and slippery when wet.	Severe: subject to ponding of surface water; remains wet for long periods of time.	Severe: subject to ponding of surface water; remains wet for long periods of time.
Whitaker: Wh	Moderate: seasonal high water table; slow to dry after rains.	Moderate: seasonal high water table; slow to dry after rains.	Moderate: seasonal high water table; slow to dry after rains.	Moderate: slow to dry after rains.	Moderate: slow to dry after rains.

[1] Frequency and intensity of flooding extremely variable; onsite inspection required.

A rating of *slight* means the facility is easily developed, improved, or maintained. There are few or no limitations that affect design or management. A *moderate* limitation means the facility usually can be developed, improved, or

2. Make preliminary evaluations of soil and ground conditions that will aid in selecting highway (fig. 19) and airport locations and in planning detailed soil surveys for [illegible]

Officials (*1*). In this system, all soil materials are classified in seven principal groups, based on mechanical analyses and plasticity test data. The groups range from A–1 (gravelly soils of high bearing capacity, the best soils for subgrades) to A–7, (clay soils having low strength when wet, the poorest soils for subgrades). Highly organic soils, such as peat and muck, are not included in this classification, as their use as a construction material or foundation material should be avoided.

Within each of the principal groups, the relative engineering value of the soil material is indicated by a group index number. Group indexes range from 0 for the best materials to 20 for the poorest. The group index number for several of the soils of Shelby County are shown in parentheses following the soil group symbol, in the next to last column in table 5. The estimated AASHO classification for all of the soils of the county is given in table 6.

Unified classification system.—Some engineers prefer to use the Unified Soil Classification System (*8*). This system is based on identification of soils according to their texture and plasticity and their performance as engineering construction materials. In the Unified system, soil materials are identified as coarse grained (eight classes), fine grained (six classes), or highly organic. The classification of the tested soils according to the Unified system is given in table 5, and the estimated classification of all the soils is given in table 6.

Engineering test data

Soil samples were taken from five locations in Shelby County. Only selected layers of each soil were sampled. The test results have been used as a general guide in estimating the engineering properties of the soils of the county.

Table 5 presents data on the relationship between the moisture content and the compacted density of the soil. If the soil material is compacted at successively higher moisture content, assuming that the same amount of force is used in compacting the soil, the density of the compacted material will increase until the "optimum moisture content" is reached. After that, the density decreases with increase in moisture content. The oven-dry weight in pounds per cubic foot of the soil at the optimum moisture content is the "maximum dry density." Data on the relationship of moisture to density are important in planning earthwork, because generally the soil is most stable if it is compacted to about its maximum dry density when it is at approximately the optimum moisture content.

California bearing ratio (CBR) gives the load-supporting capacity of a soil as compared to that of standard crushed limestone. A soil with a CBR of 16 will support 16 percent of the load that would be supported by standard crushed limestone, per unit area and with the same degree of distortion.

Mechanical analyses were made by a combination of the sieve and hydrometer methods. The liquid limit and plasticity index were determined. The results of these tests and the classification of each sample according to both the AASHO and the Unified systems are given in table 5.

The names for the various sizes of sand, silt, and clay as used by engineers are not equivalent to the names used by soil scientists. To soil scientists, for example, "clay" refers to mineral grains less than 0.002 millimeter in diameter, whereas engineers frequently define "clay" size as being less than 0.005 millimeter in diameter.

The liquid limit and plastic limit tests on the soil samples measure the effect of water on the consistency of soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a semisolid to a plastic state. As the moisture content is further increased, the material changes from the plastic state to a liquid state (the liquid limit). The plastic limit is the moisture content at which the soil material passes from a semisolid to a plastic state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is in a plastic condition.

Estimated engineering properties

In table 6 are estimates of the soil properties significant in engineering for all soils in Shelby County. Since actual tests were made only for those soils listed in table 5, it was necessary to estimate the engineering properties for the remainder of the soils. This was done by comparing them with those soils which were sampled and tested, and based upon experiences gained from working with and observing similarly classified soils in other areas. These estimates provide information about the soils that an engineer would otherwise have to obtain for himself. However, the estimates are not a substitute for the detailed tests needed at a specific site selected for construction. The information in this table, in general, applies to soil at a depth of five feet or less.

Depth to seasonal high water table.—In this column the average depth to the natural seasonal high water table of the soil in its undrained condition is given.

Depth from surface.—Normally, only the depth for the major horizons are listed. Special horizons are listed if they have engineering properties significantly different from the adjacent horizons.

Percentages passing sieves 10, 40, and 200.—The values in these columns are estimates and are rounded off to the nearest 5 percent. When there is little gravel-size material present (No. 10 sieve), the percentage of material, passing the 200 sieve approximates the amount of silt and clay in a soil.

Permeability.—Refers to movement of water downward through undisturbed soil material. Estimates are based largely on texture, structure, and consistency.

Available moisture capacity.—The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Reaction.—This column lists estimated ranges in field pH values for each major horizon.

Shrink-swell potential.—That quality of the soil that determines its volume change with moisture content. Estimated primarily on the basis of the amount and kind of clay in a soil.

TABLE 5.—*Engineering*

operation with Indiana State Highway Department and U.S. Department of Commerce,

	Report No.	Depth from surface	Moisture-density data [1]		California bearing ratio (CBR) test [2]			
			Maximum daily density	Optimum moisture	Molded specimen		CBR	Swell
					Dry density	Moisture		
		Inches	*Lb. per cu. ft.*	*Percent*	*Lb. per cu. ft.*	*Percent*	*Percent*	
	73-5-1	0-7	89	29				
	73-5-2	20-34	108	18	107.0	17.4	6	0.44
	73-5-3	38-48	122	11	124.8	10.9	20	.11
	73-4-1	0-5	116	14	116.9	13.5	5	.00
a-	73-4-2	13-25	112	14	114.0	14.7	7	.07
r	73-4-3	35-45	126	10	126.0	10.8	62	.04
	73-1-1	0-7	112	16	112.0	14.9	2	.84
	73-1-2	27-35	107	18	108.0	17.6	8	.20
r	73-1-3	46-60	135	8	131.1	8.2	92	.02
d								
	73-2-1	0-8	109	16	110.2	15.8	5	.02
-	73-2-2	16-29	110	16	110.4	15.3	16	2.40
r	73-2-3	46-56	117	12	117.5	12.0	32	.00
d								
-	73-3-1	4-11	105	18	105.7	18.4	7	.27
	73-3-2	21-45	109	18	110.1	17.4	5	.13
	73-3-3	50-60	132	8	128.8	8.0	65	.00

Method A (*1*).
). The CBR value is for 0.1-inch penetration.
) Designation T 88-57 (*1*). Results by this procedure may differ somewhat from results Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the ractions are calculated on the basis of all the material, including that coarser than 2 millie material is analyzed by the pipette method, and the material coarser than 2 millimeters

erican Association of State Highway Officials (AASHO)]

aller		Liquid limit	Plasticity index	Classification	
5 mm.	0.002 mm.			AASHO	Unified [4]
		Percent			
5	22	43	19	A–7–6(11)	CL
5	27	40	21	A–6(12)	CL
9	13	23	7	A–4(4)	ML–CL
3	7	35	13	A–6(4)	SM–SC
5	22	51	31	A–2–7(3)	SC
3	3	(5)	(5)	A–1–a(0)	SW–SM
9	13	26	9	A–4(5)	CL
1	30	60	42	A–7–6(9)	SC
5	4	(5)	(5)	A–1–a(0)	SW–SM
5	2	32	9	A–4(4)	ML–CL
7	22	47	27	A–7–6(5)	SC
8	8	(5)	(5)	A–1–b(0)	SM
8	23	48	25	A–7–6(8)	SC
5	25	44	27	A–7–6(12)	CL
3	6	(5)	(5)	A–1–b(0)	SW–SM

cal analyses used in this table are not suitable for naming

ed that any soil having a plasticity index within 2 points of obtained by this use are ML–CL and SM–SC.

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significant in engineering

soils may have different properties and limitations, it is necessary to follow carefully the instructions for referring to other series that appear because these land types have such variable properties. The symbol > means more than]

Percentage passing sieve—			Permeability	Available moisture capacity	Reaction	Shrink-swell potential
No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				
			Inches per hour	*Inches per inch of soil*	*pH value*	
100	70–85	40–55	2. 0–6. 30	0. 12–0. 15	6. 6–7. 0	Low.
100	80–90	35–55	0. 63–2. 0	0. 16–0. 20	5. 4–6. 0	Moderate.
100	70–85	25–35	0. 63–2. 0	0. 14–0. 16	6. 6–7. 3	Low.
100	95–100	85–95	0. 20–0. 63	0. 18–0. 21	6. 6–7. 3	Moderate to high.
100	90–100	70–90	0. 06–0. 20	0. 16–0. 21	6. 6–7. 3	Moderate to high.
100	85–95	60–75	0. 06–0. 20	0. 14–0. 16	(1)	Low.
100	100	95–100	0. 63–2. 00	0. 13–0. 15	6. 6–7. 3	Moderate.
100	100	95–100	0. 20–0. 63	0. 13–0. 15	6. 6–7. 3	Moderate to high.
100	90–100	70–90	0. 63–2. 00	0. 18–0. 22	6. 6–7. 3	Low to moderate.
100	90–100	70–80	0. 06–0. 20	0. 18–0. 21	5. 6–6. 5	Moderate.
100	85–95	60–75	0. 20–0. 63	0. 14–0. 16	(1)	Low to moderate.
100	85–95	60–75	0. 63–2. 00	0. 18–0. 22	(1)	Moderate.
100	70–90	50–75	0. 63–2. 00	0. 14–0. 18	(1)	Moderate.
95–100	85–95	50–75	0. 63–2. 00	0. 16–0. 18	6. 6–7. 3	Low.
70–80	60–70	45–65	0. 63–2. 00	0. 14–0. 17	6. 1–6. 5	Moderate.
60–70	15–30	5–12	>20. 0	0. 02–0. 04	(1)	Low.
100	85–95	60–75	0. 63–2. 00	0. 18–0. 22	(1)	Low.
100	60–70	40–60	0. 63–2. 00	0. 14–0. 16	(1)	Moderate.
90–100	40–70	30–50	0. 63–2. 00	0. 10–0. 14	(1)	Low.
100	60–70	30–40	2. 00–6. 30	0. 08–0. 12	(1)	Low.
100	70–80	30–45	2. 00–6. 30	0. 12–0. 14	(1)	Low.
100	50–70	5–12	6. 30–20. 00	0. 02–0. 04	(1)	Low.
100	85–95	60–75	0. 63–2. 00	0. 16–0. 18	(1)	Moderate.
100	85–95	60–75	0. 63–2. 00	0. 14–0. 18	(1)	Low.
100	95–100	85–95	0. 20–0. 63	0. 19–0. 21	6. 6–7. 3	Moderate.
100	90–100	75–95	0. 06–0. 20	0. 18–0. 22	6. 6–7. 3	Moderate to high.
90–100	85–95	70–90	0. 20–0. 63	0. 14–0. 18	(1)	Moderate.
			6. 30–20. 00	0. 22–0. 26	6. 6–7. 3	Low.
100	30–90	36–50	0. 06–0. 20	0. 14–0. 18	(1)	Moderate.
100	85–95	60–75	0. 63–2. 00	0. 15–0. 19	6. 6–7. 3	Low.
90–100	90–100	70–80	0. 63–2. 00	0. 16–0. 18	5. 6–7. 3	Moderate.
95–100	65–90	15–25	2. 00–6. 30	0. 10–0. 12	(1)	Low.
100	90–100	70–90	0. 63–2. 00	0. 19–0. 23	6. 6–7. 3	Low.
100	85–95	60–75	0. 63–2. 00	0. 15–0. 19	(1)	Moderate.
100	80–95	50–75	0. 63–2. 00	0. 14–0. 17	(1)	Low to moderate.

TABLE 6.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	Classification		
	Bedrock	Seasonal high water table		USDA texture	Unified	AASHO
	Feet	*Feet*	*Inches*			
*Miami: MIB2, MIC2, MID2, MmB3, MmC3, MmD3, MrB. For properties of Crosby soil in MrB, see Crosby series.	>15	>6	0–10	Silt loam	ML or CL	A–4
			10–40	Clay loam	CL	A–7
			40–70	Loam (till)	CL	A–4
Millsdale: Ms	2–3½	0–1	0–34	Silty clay loam	CL or CH	A–7
			34	Limestone bedrock.		
Milton: MtB	2–3½	>6	0–8	Silt loam	ML or CL	A–4
			8–23	Clay loam	CL or CH	A–7
			23–30	Gravelly clay loam	ML or CL	A–6
			30	Limestone bedrock.		
Negley: NeD2, NeE	>15	>6	0–12	Loam	CL	A–4
			12–29	Clay loam	CL	A–6
			29–50	Sandy clay loam	SC or CL	A–6
			50–120	Stratified sandy clay loam and clay loam.	SC or CL	A–6
			120–150	Sand and gravel	SP–SM	A–2–4
Nineveh: NnA, NnB	>15	>6	0–13	Loam	CL, SM–SC	A–4, A–6
			13–36	Gravelly clay loam	SC or CL	A–2 or A–4
			36–54	Gravel and sand	SW–SM	A–1
Ockley: OcA	>15	>6	0–11	Loam	CL	A–4
			11–37	Clay loam	CL, SC	A–7
			37–46	Gravelly clay loam	SC	A–2–6 or A–6
			46–60	Gravel and sand	SP–SM	A–1, A–2–4
Parke: PaB2, PaC2	>15	>6	0–13	Silt loam	ML or CL	A–4
			13–23	Silty clay loam	CL	A–6
			23–52	Clay loam	CL	A–6
			52–120	Stratified sandy clay loam, clay loam, and loam.	SC or CL	A–4
			120–140	Sand and gravel	SP–SM	A–2–4
Princeton: PrA, PrB, PrC	>15	>6	0–12	Fine sandy loam	SM or ML	A–4
			12–38	Sandy clay loam	SC or CL	A–6
			38–47	Sandy loam	SM	A–2–4 or A–4
			47–65	Fine sand	SP–SM	A–3
Randolph: Ra	2–3½	1–3	0–9	Silt loam	ML or CL	A–4
			9–23	Silty clay	CL or CH	A–7
			23–27	Clay	CH	A–7
			27	Limestone bedrock.		

See footnotes at end of table.

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TABLE 6.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	Classification		
	Bedrock	Seasonal high water table		USDA texture	Unified	AASHO
	Feet	*Feet*	*Inches*			
Rensselaer: Re	>15	0–1	0–48	Clay loam	CL	A–7 or A–6
			48–60	Sand, silt, and fine gravel	ML or SM	A–4 or A–2–4
Rodman: RoE	>15	>6	0–13	Gravelly loam	ML	A–4
			13–24	Gravel and sand	SP–SM	A–1–b
Ross: Rt	>15	>6	0–17	Silt loam	ML or CL	A–4
			17–34	Loam	CL	A–4
			34–53	Silt loam	ML or CL	A–4
Ross series, moderately deep variant: Rs.	>15	>6	0–19	Loam	CL	A–2–4 or A–4
			19–30	Gravelly loam	SM	A–4
			30–72	Gravel and sand	SP–SM	A–1–b
Saranac: Sa	>15	0–1	0–19	Silty clay loam	CL	A–6
			19–39	Silty clay	CL or CH	A–7
			39–50	Stratified silt, clay and sand	ML or CL	A–6 or A–4
Sebewa: Se	>15	0–1	0–15	Clay loam	CL	A–6
			15–32	Gravelly clay loam	CL or SC	A–6
			32–60	Gravel and sand	SP–SM	A–1–b
Shoals:[2] Sh	>15	1–3	0–60	Silt loam	ML or CL	A–4
Sleeth: Sm	>15	1–3	0–11	Loam	CL	A–4
			11–32	Clay loam	CL	A–7
			32–48	Gravelly clay loam	ML or CL	A–6
			48–55	Gravel and sand	SP or SM	A–1 or A–2
*Westland: Wc, We For properties of Brookston soil in We, see Brookston series.	>15	0–1	0–40	Clay loam	CL	A–7
			40–45	Gravelly clay loam	CL or SC	A–6 or A–7
			45–55	Gravel and sand	SP–SM	A–1–b
Whitaker: Wh	>15	1–3	0–19	Loam	CL	A–4
			19–38	Clay loam	CL	A–7
			38–48	Sandy clay loam	SC or CL	A–6
			48–72	Fine sand and silt	SM	A–2–4 or A–4

[1] Moderately alkaline.

Reaction	Shrink-swell potential
pH value	
6. 6–7. 3	Moderate.
(1)	Moderate to low.
(1)	Low.
(1)	Low.
6. 3–7. 3	Low.
6. 3–7. 3	Moderate.
6. 3–7. 3	Moderate.
(1)	Low.
(1)	Low.
(1)	Low.
6. 3–7. 3	Moderate.
6. 3–7. 3	Moderate to high.
(1)	Moderate.
6. 3–7. 3	Moderate to high.
6. 3–7. 3	Moderate.
(1)	Low.
6. 3–7. 3	Moderate.
6. 6–7. 3	Low.
5. 6–6. 5	Moderate.
(1)	Moderate.
(1)	Low.
6. 6–7. 3	Moderate to high.
(1)	Moderate.
(1)	Low.
5. 1–6. 5	Low.
5. 1–5. 5	Moderate to high.
6. 6–7. 3	Moderate.
(1)	Low.

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engineering properties

soils may have different properties and limitations, it is necessary to follow carefully the instructions for referring to other series that appear because these land types have properties too variable to be rated]

Soil features affecting—Continued						Soil limitations for septic tank filter fields
Levee and pond embankments	Farm pond reservoir areas	Agricultural drainage	Terraces and diversions	Grassed waterways	Foundations for low buildings	
Subsoil: fair to good compaction characteristics; low permeability when compacted; good resistance to piping; fair stability. Substratum: fair to good compaction characteristics; moderate permeability when compacted; poor resistance to piping; fair stability.	Seasonal high water table; seepage through sand seams.	Moderate permeability; seasonal high water table; substratum unstable when saturated.	Not needed except to divert runoff from adjoining higher areas.	Not needed except in areas where a concentrated flow of water comes from adjoining higher areas.	Moderate frost-heaving; potential seasonal high water table at depth of 12 to 36 inches; moderate shrink-swell potential in subsoil.	Severe: seasonal high water table at depth of 12 to 36 inches.
Subsoil and substratum: fair to good compaction characteristics; low permeability when compacted; good resistance to piping; fair to good stability.	Slow seepage; high water table; normally suited to pit ponds.	Slow permeability; seasonal high water table at depth of 0 to 12 inches; areas of surface water ponding.	Not needed except to divert runoff from adjoining higher areas.	Not needed except in areas where a concentrated flow of runoff water comes from adjoining higher areas.	Slow permeability; moderate to high shrink-swell potential; medium to high compressibility; seasonal high water table at depth of 0 to 12 inches.	Severe: slow permeability; seasonal high water table at depth of 0 to 12 inches; areas of surface water ponding.
Shallow to bedrock; steep slopes.	Porous limestone bedrock at a depth of less than 24 inches; high seepage potential.	Steep slopes; not needed.	Steep slopes; shallow to bedrock.	Steep slopes; bedrock at a depth of less than 24 inches.	Steep slopes; bedrock at a depth of less than 24 inches.	Severe: steep slopes; limestone bedrock at depth of less than 24 inches.
Subsoil and substratum: fair to good compaction characteristics; low permeability when compacted; good resistance to piping; fair to good stability.	Slow seepage; high water table; normally suited to pit ponds.	Slow permeability; seasonal high water table at depth of 12 to 36 inches; areas of CsB may lack adequate outlets.	No limitations; soil features favorable.	No limitations....	Moderate shrink-swell potential; moderate to high frost-heaving potential; seasonal high water table at depth of 12 to 36 inches.	Severe: slow permeability; seasonal water table at depth of 12 to 36 inches.
Subsoil and substratum: fair compaction characteristics; low permeability when compacted; fair to good resistance to piping; fair stability.	Subject to flooding; moderate to slow seepage rate.	Subject to flooding.	Not needed except to divert runoff from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas or where overflow water concentrates.	Subject to flooding; moderate shrink-swell potential; moderate to high frost-heaving potential; fair shear strength.	Severe: subject to stream flooding.

TABLE 7.—*Interpretations of*

	Soil features affecting—
1	Highway location
ir shear ım com- r to good ırac- good: ibility; ll poten- ıd shear	Moderate shrink-swell potential; medium compressibility; well-drained side slopes difficult to vegetate.
tratum moderate ıtential; n char- derate to ving po- m com- l in places gravel and	Subject to flooding; moderate shrink-swell potential; moderate to high frost-heaving potential; medium compressibility.
ir to good , slight ; -heaving	Subject to overflow; slight compressibility; moderate frost-heaving potential.
tratum e shrink- ; medium ; fair to on	Steep slopes; cuts and fills needed; moderate shrink-swell potential; medium compressibility.

	ions for ildings	Soil limitations for septic tank filter fields
	h; mod- rink- otential; n com- lity of soil.	Slight where slopes are 0 to 6 percent: possible pollution of water supplies by effluent. Moderate where slopes are 6 to 12 percent. Severe where slopes are 12 to 18 percent.
	o flood- derate swell al; slight ium com- ility.	Severe: subject to stream flooding.
	o g; poor ice to	Severe: subject to stream flooding.
	e shrink- otential; n essibility; lopes; good y; ate eaving ial.	Severe: steep slopes.

BLE 7.—*Interpretations of*

	Soil features affecting—
	Highway location
f h r; -	Areas of surface water ponding; seasonal water table at a depth of 0 to 12 inches; medium to high compressibility; medium to high shrink-swell potential.
e; h bn m y.	Organic layer: high compressibility; high frost-heaving potential; seasonal high water table at a depth of 0 to 12 inches; areas of surface water ponding; unstable.
e ; g :	Moderate shrink-swell potential; moderate frost-heaving potential.

engineering properties—Continued

Soil features affecting—Continued						Soil limitations for septic tank filter fields
Levee and pond embankments	Farm pond reservoir areas	Agricultural drainage	Terraces and diversions	Grassed waterways	Foundations for low buildings	
Subsoil: fair to poor stability; fair to poor compaction characteristics; low permeability when compacted; good resistance to piping. Substratum: in upland position, has similiar characteristics as subsoil; in terrace position, has moderate to high permeability when compacted and fair to poor resistance to piping.	High water table; slow seepage rate; normally suited to pit ponds.	Slow permeability; adequate outlets may be difficult to establish; seasonal high water table at depth of 0 to 12 inches; areas of surface water ponding.	Not needed except to divert runoff from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas.	Moderate to high shrink-swell potential; fair to poor shear strength; medium to high compressibility; moderate to high frost-heaving potential; high water table at depth of 0 to 12 inches.	Severe: slow permeability; seasonal high water table at depth of 0 to 12 inches; areas of surface water ponding.
Organic layer: poor stability; poor compaction characteristics; rapid permeability when compacted; poor resistance to piping.	High water table; 12 to 42 inches of organic material; slow seepage in substratum; normally suited to pit ponds.	Organic material subject to subsidence; high water table at a depth of 0 to 12 inches; water may pond on surface; organic material unstable when saturated.	Not needed except to divert runoff from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining areas.	Poor stability; high compressibility; high frost-heaving potential; low shrink-swell potential; poor shear strength; high water table at depth of 0 to 12 inches.	Severe: seasonal high water table at a depth of 0 to 12 inches.
Subsoil: fair to good compaction characteristics; low permeability when compacted; fair to good stability; good resistance to piping. Substratum: fair stability; fair to good compaction characteristics; moderate permeability when compacted; poor resistance to piping.	Moderate to rapid seepage rate; sand and silt in substratum.	Not needed; well drained.	Soil features favorable; slopes usually short.	Soil features favorable.	Moderate shrink-swell potential; fair shear strength; moderate frost-heaving potential.	Slight where slopes are 0 to 6 percent: hazard of contaminating nearby water supplies. Moderate where slopes are 6 to 12 percent.

pretations of

atures ing—	location
overflow; shrink- ential; to high ving ; medium ibility.	
ls needed moderate rink-swell ; medium ompressi- gh frost- otential.	
depth of inches; to high ell poten- ium to pressibil- rate to t-heaving ; seasonal er table at 0 to 1 foot; urface nding.	
depth of inches; to high ibility; to high ving	

ntinued

and ns	Grassed waterways	Foundations for low buildings	Soil limitations for septic tank filter fields
d o nnoff join- er	Generally not needed except where a concentrated flow of water comes from adjoining higher areas or where overflow water concentrates.	Subject to flooding; moderate shrink-swell potential; moderate to high frost-heaving potential; fair shear strength.	Severe: subject to flooding.
es le.	Soil features favorable.	Moderate to high shrink-swell potential; fair shear strength; medium to high compressibility.	Moderate where slopes are 12 percent or less: moderately slow permeability. Severe where slopes are more than 12 percent.
d ex- divert rom ng reas; at f 20 ches.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas.	Moderate to high shrink-swell potential; fair to poor shear strength; medium to high compressibility; moderate to high frost-heaving potential; seasonal high water table at depth of 0 to 1 foot; bedrock at depth of 20 to 40 inches.	Severe: slow permeability; bedrock at depth of 20 to 40 inches; seasonal high water table at depth of 0 to 12 inches; areas of surface water ponding.
t f 20 ches; to n ue to	No limitations except bedrock at depth of 20 to 40 inches.	Bedrock at depth of 20 to 40 inches; moderate to high shrink-swell potential; fair to poor shear strength; medium to high compressibility; moderate to high frost-heaving potential.	Severe: moderate permeability; limestone bedrock at depth of 20 to 40 inches.

TABLE 7.—*Interpretations of*

nbols	Suitability as source of—			Soil features affecting—
	Topsoil	Sand and gravel	Road fill	Highway location
------	Surface layer fair to good. Subsoil poor to fair: somewhat clayey and gravelly; low in organic-matter content and fertility.	Fair to good: gravel and sand below depth of 10 or 12 feet.	Subsoil fair: fair to good compaction characteristics; fair stability; moderate to high frost-heaving potential. Substratum good: slight compressibility.	Cuts and fills needed in places; side slopes difficult to vegetate; slight to medium compressibility; moderate to high frost-heaving potential.
------	Surface layer fair to good: contain ½- to 2-inch pebbles in places. Subsoil fair to poor: somewhat gravelly and clayey; low in fertility.	Good below depth of about 3 feet.	Subsoil poor: fair shear strength; medium compressibility; fair to good compaction characteristics. Substratum very good: slight compressibility; low shrink-swell potential; fair to good shear strength.	Moderate shrink-swell potential; medium compressibility; well-drained side slopes; difficult to vegetate.
------	Surface layer good. Subsoil fair to poor: somewhat clayey and gravelly; low in organic-matter content and fertility.	Good below depth of about 4 feet.	Subsoil poor: fair shear strength; medium compressibility; fair to good compaction characteristics. Substratum very good: slight compressibility; low shrink-swell potential; fair to good shear strength.	Moderate shrink-swell potential; compressibility; well-drained side slopes; difficult to vegetate.

engineering properties—Continued

Soil features affecting—Continued						Soil limitations for septic tank filter fields
Levee and pond embankments	Farm pond reservoir areas	Agricultural drainage	Terraces and diversions	Grassed waterways	Foundations for low buildings	
Subsoil: fair stability; fair to good compaction characteristics; low permeability; good resistance to piping. Substratum: fair stability; fair to good compaction characteristics; high permeability when compacted; fair to poor resistance to piping.	Moderate to rapid seepage rate.	Not needed; well drained.	Steep slopes	Steep slopes; soil features favorable.	Subsoil: moderate shrink-swell potential; fair to good shear strength; slight to medium compressibility of subsoil; slight compressibility of substratum.	Severe: steep slopes.
Subsoil: fair to good stability; fair to good compaction characteristics; low permeability when compacted; good resistance to piping. Substratum: fair to good compaction characteristics; moderate to high permeability when compacted.	Rapid seepage rate; too sandy and gravelly to hold water.	Not needed; well drained.	Depth to loose gravel and sand is 24 to 42 inches.	Depth to loose gravel and sand is 24 to 40 inches.	Fair shear strength; moderate shrink-swell potential; medium to high compressibility of the subsoil; slight compressibility of substratum.	Slight: possible pollution of water supplies by effluent.
Subsoil: fair to good stability; fair to good compaction characteristics; low permeability when compacted; good resistance to piping. Substratum: fair to good stability; fair to good compaction characteristics; moderate to high permeability when compacted.	Rapid seepage rate; too sandy and gravelly to hold water.	Not needed; well drained.	Not needed	Soil features favorable; generally not needed in level area.	Fair shear strength; moderate shrink-swell potential; medium to high compressibility of subsoil; slight compressibility of substratum.	Slight: possible pollution of water supplies by effluent.

TABLE 7.—*Interpretations of*

	Soil features affecting—
d fill	Highway location
fair to good n characteris- ability; mod- gh frost good: slight ility.	Cuts and fills needed in places; side slopes difficult to vegetate; slight to medium compressibility; moderate to high frost-heaving potential.
o good: hrink-swell moderate ng potential; r shear good: slight ility.	Moderate shrink-swell potential in subsoil; slight compressibility; moderate frost-heaving potential; cuts needed in places.
ck at depth inches. medium to ressibility; o high ll potential; gh water pth of 12 to	Bedrock at depth of 20 to 40 inches; medium to high compressibility; moderate to high frost-heaving potential.

features affecting—Continued				Soil limitations for septic tank filter fields
cultural ainage	Terraces and diversions	Grassed waterways	Foundations for low buildings	
eeded; drained.	Soil features favorable.	Soil features favorable.	Moderate shrink-swell potential; fair shear strength; medium to high compressibility of subsoil; slight compressibility of substratum.	Slight where slopes are 2 to 6 percent. Moderate where slopes are 6 to 12 percent.
eeded; l drained.	Soil features favorable.	Soil features favorable.	Moderate shrink-swell potential; good to fair shear strength; slight compressibility; moderate frost-heaving potential.	Slight where slopes are 0 to 6 percent. Moderate where slopes are 6 to 12 percent.
ck at th of 20 0 inches; lerately r permea- y; high er table epth of o 36 es.	Not needed except to divert runoff from adjoining higher areas; bedrock at depth of 20 to 40 inches.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas; bedrock at depth of 20 to 40 inches.	Bedrock at depth of 20 to 40 inches; moderate to high shrink-swell potential; fair to poor shear strength; medium to high compressibility; moderate to high frost-heaving potential; seasonal high water table at depth of 12 to 36 inches.	Severe: moderately slow permeability; bedrock at depth of 20 to 40 inches; seasonal high water table at depth of 12 to 36 inches.

TABLE 7.—*Interpretations of*

Soil series and map symbols	Suitability as source of—			Soil features affecting—
	Topsoil	Sand and gravel	Road fill	Highway location
Rensselaer: Re	Surface layer fair: sticky when wet. Subsoil poor: clayey; seasonal high water table at depth of 0 to 1 foot.	Generally not suitable; a few isolated pockets of sand and gravel.	Subsoil poor: moderate shrink-swell potential; medium to high compressibility; fair shear strength; seasonal high water table at depth of 0 to 1 foot. Substratum fair to poor: fair to good compaction characteristics.	Seasonal high water table at depth of 0 to 1 foot; areas of surface water ponding; moderate shrink-swell potential; moderate to high frost-heaving potential; medium to high compressibility.
Rodman: RoE	Surface layer and subsoil poor to very poor: gravelly.	Good	Subsoil and substratum good: slight compressibility; low shrink-swell potential.	Steep topography; side slopes difficult to vegetate; shallow to loose gravel and sand.
Ross: Rt	Surface layer and subsoil good: subject to flooding.	Generally not suitable; gravel and sand in the underlying material in places.	Subsoil and substratum fair to poor: moderate shrink-swell potential; moderate to high frost-heaving potential; fair compaction characteristics; fair stability; medium compressibility.	Subject to flooding; moderate shrink-swell potential; moderate to high frost-heaving potential; medium compressibility.
Ross series, moderately deep variant: Rs.	Surface layer fair: gravelly in places. Subsoil poor: gravelly.	Good at depth below 2 to 3 feet.	Substratum good: slight compressibility; low shrink-swell potential.	Subject to flooding; slight compressibility.

—Continued

Soil features affecting—Continued					Soil limitations for septic tank filter fields
Farm pond reservoir areas	Agricultural drainage	Terraces and diversions	Grassed waterways	Foundations for low buildings	
gh water able; moderate to rapid seepage rate; normally suited to pit ponds that expose the water table.	Slow permeability; seasonal high water table at a depth of 0 to 1 foot; areas of surface water ponding.	Not needed except where concentrated runoff flows from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas.	Moderate shrink-swell potential; medium to high compressibility; fair shear strength; high water table at depth of 0 to 1 foot.	Severe: slow permeability; seasonal high water table at depth of 0 to 1 foot; areas of surface water ponding.
pid seepage ate; too ravelly and andy to hold vater.	Not needed	Steep slopes; loose gravel at a depth of less than 20 inches.	Steep slopes; shallow to loose gravel and sand.	Steep slopes; poor stability; low shrink-swell potential; very slight compressibility; low frost-heaving potential.	Severe: steep slopes.
ject to looding; low seepage ate.	Not needed; well drained.	Not needed except to divert runoff from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas.	Subject to flooding; moderate shrink-swell potential; slight to medium compressibility.	Severe: subject to stream flooding.
pid seepage ate; subject o flooding.	Not needed; well drained.	Not needed	Generally not needed except where a concentrated flow of water comes from adjoining higher areas; loose gravel at depth below 2 to 3 feet.	Subject to flooding; low shrink-swell potential; fair shear strength; very slight compressibility.	Severe: subject to flooding; possible pollution of water by effluent.

TABLE 7.—*Interpretations of*

Soil series and map symbols	Suitability as source of—			Soil features affecting—
	Topsoil	Sand and gravel	Road fill	Highway location
Saranac: Sa	Surface layer fair: sticky when wet. Subsoil poor: clayey; seasonal high water table at depth of 0 to 1 foot.	Generally not suitable; a few isolated pockets of gravel and sand in the underlying material.	Subsoil and substratum poor: high seasonal water table at depth of 0 to 1 foot; fair to poor compaction characteristics; moderate to high shrink-swell potential; plastic and sticky when wet.	Subject to flooding; medium to high compressibility; moderate to high shrink-swell potential; seasonal high water table at depth of 0 to 1 foot; areas of surface water ponding.
Sebewa: Se	Surface layer fair: sticky when wet. Subsoil poor: clayey; gravelly; seasonal high water table at depth of 0 to 1 foot.	Fair to good: variable amount of fines.	Subsoil poor: moderate to high shrink-swell potential; medium to high compressibility; high seasonal water table at depth of 0 to 1 foot.	Seasonal high water table at depth of 0 to 1 foot; areas of surface water ponding; moderate to high shrink-swell potential; moderate to high frost-heaving potential; medium to high compressibility.
Shoals: Sh	Surface layer and subsoil good: underlying material variable; subject to flooding; seasonal high water table.	Generally not suitable; few isolated pockets of gravel and sand in the underlying material.	Subsoil and substratum fair to poor: moderate to high frost-heaving potential; moderate shrink-swell potential seasonal high water table at depth of 0 to 1 foot.	Subject to flooding; moderate shrink-swell potential; medium compressibility; seasonal high water table at depth of 12 to 36 inches.

ring properties—Continued

Soil features affecting—Continued						Soil limitations for septic tank filter fields
and pond nkments	Farm pond reservoir areas	Agricultural drainage	Terraces and diversions	Grassed waterways	Foundations for low buildings	
and sub-um: fair oor stabil-air to poor paction acteristics; ermea-when pacted; resistance ping.	High water table; subject to flooding; slow seepage rate; normally suited to pit ponds.	Subject to flooding; slow permeability; high water table at depth of 0 to 1 foot; areas of surface water ponding.	Not needed except to divert runoff from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas or where overflow water concentrates.	Subject to flooding; moderate to high shrink-swell potential; fair to poor shear strength; medium to high compressibility; high water table at depth of 0 to 1 foot.	Severe: slow permeability; seasonal high water table at depth of 0 to 1 foot; areas of surface water ponding.
: fair to stability; o good paction acteristics; ermea-when pacted; resistance ping. atum: to good ility; fair od com-ion char-ristics; erate to permea-y when pacted.	Seasonal high water table; substratum has rapid seepage rate; normally suited to pit ponds.	Loose sand and gravel substratum at depth of 24 to 42 inches; seasonal high water table at depth of 0 to 1 foot; areas of surface water ponding.	Not needed except to divert runoff from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas.	Moderate to high shrink-swell potential; medium to high compressibility; fair shear strength; high water table at depth of 0 to 1 foot.	Severe: seasonal high water table at depth of 0 to 1 foot; areas of surface water ponding.
l and sub-um: fair paction acteristics; permeabil-vhen com-ed; fair to l resistance iping; fair ility.	Subject to flooding; high water table; moderate to slow seepage rate; normally suited to pit ponds that expose the water table.	Subject to flooding; high water table at depth of 12 to 36 inches.	Not needed except to divert runoff from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas or where overflow water concentrates.	Subject to flooding; moderate shrink-swell potential; moderate to high frost-heaving potential; fair shear strength; seasonal high water table at depth of 12 to 36 inches.	Severe: subject to stream flooding; seasonal high water table at depth of 12 to 36 inches.

TABLE 7.—*Interpretations of*

Soil series and map symbols	Suitability as source of—			Soil features affecting—
	Topsoil	Sand and gravel	Road fill	Highway location
Sleeth: Sm	Surface layer fair to good: low in organic-matter content. Subsoil: clayey; low in fertility and organic-matter content; seasonal high water table at depth of 12 to 36 inches.	Good below depth of about 4 feet.	Subsoil fair to poor: moderate shrink-swell potential; good to fair shear strength; moderate frost-heaving potential; seasonal high water table at depth of 1 to 3 feet. Substratum good: may be difficult to use because of the high water table.	Seasonal water table at depth of 12 to 36 inches; moderate shrink-swell potential; moderate frost-heaving potential.
*Westland: Wc, We. For properties of Brookston soil in We, see Brookston series.	Surface layer fair: sticky when wet. Subsoil poor: clayey; somewhat gravelly; seasonal high water table at depth of 0 to 12 inches.	Good below depth of about 4 feet. Areas of We on the uplands are unsuitable.	Subsoil poor: moderate to high shrink-swell potential; medium to high compressibility; fair shear strength; seasonal high water table at depth of 0 to 1 foot. Substratum good: high water table may make it difficult to use.	Seasonal high water table at a depth of 0 to 1 foot; areas of surface water ponding; moderate to high shrink-swell potential; moderate to high frost-heaving potential; medium to high compressibility.
Whitaker: Wh	Surface layer fair to good: low in organic-matter content. Subsoil fair to poor: somewhat clayey; low in fertility and organic-matter content; seasonal high water table at depth of 12 to 36 inches.	Fair for sand: variable textures in underlying material.	Subsoil poor: moderate to high shrink-swell potential; medium to high compressibility; moderate to high frost-heaving potential; seasonal high water table at depth of 12 to 36 inches. Substratum fair to poor: variable textures; fair stability; fair compaction characteristics.	Seasonal high water table at depth of 12 to 36 inches; moderate to high shrink-swell potential; medium to high compressibility; moderate to high frost-heaving potential.

engineering properties—Continued

Soil features affecting—Continued						Soil limitations for septic tank filter fields
Levee and pond embankments	Farm pond reservoir areas	Agricultural drainage	Terraces and diversions	Grassed waterways	Foundations for low buildings	
Subsoil: fair to good stability; fair to good compaction characteristics; low permeability when compacted; good resistance to piping. Substratum: fair to good stability; fair to good compaction characteristics; moderate to high permeability when compacted; fair to good resistance to piping.	High water table; rapid seepage rate in substratum; normally suited to pit ponds that expose the water table.	Seasonal high water table at depth of 12 to 36 inches; moderate permeability.	Not needed except to divert runoff from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas.	Moderate shrink-swell potential; good to fair shear strength; moderate frost-heaving potential; seasonal high water at depth of 12 to 36 inches.	Severe: seasonal high water table at depth of 12 to 36 inches.
Subsoil: fair to good stability; fair to good compaction characteristics; low permeability when compacted; good resistance to piping. Substratum: fair to good stability; fair to good compaction characteristics; moderate to high permeability when compacted.	High water table; rapid seepage rate in substratum; normally suited to pit ponds that expose the water table.	Slow permeability; seasonal high water table at depth of 0 to 1 foot; areas of surface water ponding.	Not needed except to divert runoff from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas.	Moderate to high shrink-swell potential; medium to high compressibility; fair shear strength; high water table at depth of 0 to 12 inches.	Severe: slow permeability; seasonal high water table at depth of 0 to 1 foot; areas of surface water ponding.
Subsoil: fair to good; fair to good compaction characteristics; low permeability when compacted; good resistance to piping. Substratum: fair stability; fair compaction characteristics; moderate permeability when compacted; poor resistance to piping.	High water table; rapid seepage rate in substratum; normally suited to pit ponds that expose the water table.	Seasonal high water table at depth of 12 to 36 inches; moderate permeability.	Not needed except to divert runoff from adjoining higher areas.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas.	Moderate to high shrink-swell potential; medium to high frost-heaving; potential seasonal high water table at depth of 12 to 36 inches.	Severe: seasonal high water table at depth of 12 to 36 inches.

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of profile development within a given time, on a given parent material, and under the same type of vegetation depends largely on the amount of water that passes through the soil material.

Because of the variation of relief in this county, several different soils have formed from the same kind of parent material. The topographic relationships of selected soil series are illustrated in figure 21.

A good example of the way relief has affected soils that formed in the same kind of parent material is the Miami catena of soils that formed in till. The Crosby soils are nearly level and slowly permeable. The Miami soils are sloping to moderately steep, well drained, brown to dark brown, and moderately slowly permeable. The Hennepin soils, which are very steep, have a less strongly developed profile than the sloping to moderately steep Miami soils. The dark-colored Brookston soils formed in slight depressions.

Time

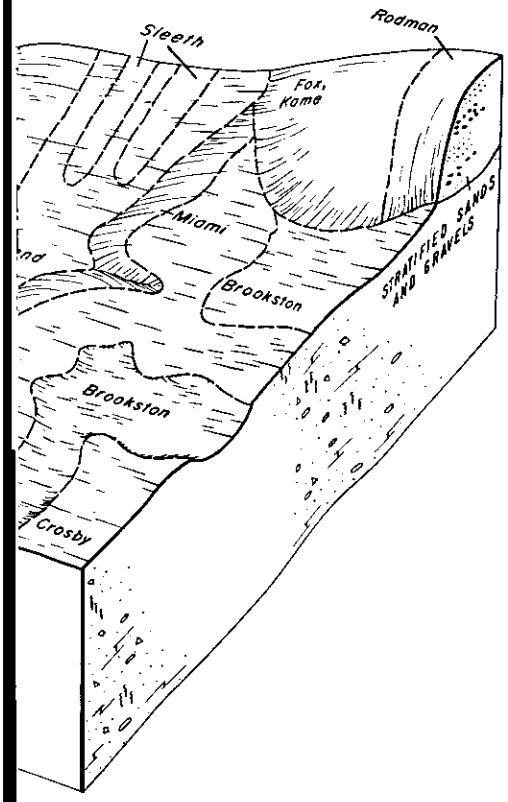
In Shelby County, generally, the longer the parent material has remained in place the more fully developed the soil profiles are.

Because of differences in parent material, relief, and climate, some soils mature more slowly than others. For example, alluvial soils are immature because the parent materials are young and new materials are deposited periodically. Steep soils are also likely to be immature because geological erosion removes the soil material as fast as it accumulates; also, runoff is greater and less water infiltrates the soil. Some kinds of parent rock are so resistant to weathering that soil development is very slow, even though other conditions are favorable.

A mature soil is one that has well-developed A and B horizons that were produced by the natural processes of soil formation. An immature soil has little or no horizon differentiation. In Shelby County the oldest soils formed from glacial outwash materials of Illinoian age (approximately 240,000 years since the material was deposited). They have well-developed profiles and are considered to be mature or nearly so. Negley and Parke soils formed in outwash of Illinoian age. Most of the soils on terraces and uplands formed in deposits of Wisconsin age drift (deposited 20,000 to 25,000 years ago). Terrace soils are along the streams. These soils generally are not so highly or deeply leached as those that formed in Illinoian outwash and have less strongly developed profiles.

Young soils are generally steep or nearly level. The steep soils, such as those of the Hennepin and Rodman series, are shallow because geologic erosion has removed the soil material about as fast as it has accumulated. The nearly level soils, such as those of the Genesee, Eel, Shoals, Ross, and Medway series are on bottom lands, where they periodically receive fresh deposits of soil material.

Sandy, windblown material was deposited on uplands along streams at about the time of the Wisconsin glaciation. This was the parent material of the well-drained Princeton soils and the somewhat poorly drained Ayrshire soils.



nderlying materials. Diagram shows an alluvial

of Jackson Township, the upland soils
al that ranges from calcareous loam to
ll. Miami soils developed on gentle slopes
es that are along the breaks of rivers and
soils formed in the nearly level areas,
ormed in the steep to extremely steep
ark-colored Brookston soils formed in

dges in Jackson Township, some of the
Illinoian age gravel and sand. This area
ssed by the Wisconsin Glacier. Negley
eveloped here.

n the southwestern and western parts of
ils formed in windblown sandy deposits.
f Wisconsin age and was first deposited
glacial melt water. It was then blown
nds. It ranges in thickness from less than
or more. Princeton and Ayrshire soils
material.

rocesses other than glaciation started to
lacier retreated northward.

formed in water-laid material are vari-
formed in outwash that contains a con-
of sand and gravel. The outwash was
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	Subgroup	Order
--	Aeric Ochraqualfs	Alfisols.
--	Typic Argiaquolls	Mollisols.
--	Lithic Argiudolls	Mollisols.
--	Aeric Ochraqualfs	Alfisols.
--	Fluvaquentic Eutrochrepts	Inceptisols.
l,	Typic Hapludalfs	Alfisols.
--	Fluventic Eutrochrepts	Inceptisols.
--	Fluventic Eutrochrepts	Inceptisols.
--	Typic Eutrochrepts	Inceptisols.
--	Typic Argiaquolls	Mollisols.
--	Terric Medisaprists	Histosols.
--	Typic Hapludalfs	Alfisols.
--	Fluvaquentic Hapludolls	Mollisols.
--	Typic Hapludalfs	Alfisols.
--	Typic Argiaquolls	Mollisols.
--	Typic Hapludalfs	Alfisols.
--	Ultic Hapludalfs	Alfisols.
l,	Typic Argiudolls	Mollisols.
--	Typic Hapludalfs	Alfisols.
--	Typic Hapludults	Ultisols.
--	Typic Hapludalfs	Alfisols.
--	Aeric Ochraqualfs	Alfisols.
--	Typic Argiaquolls	Mollisols.
--	Typic Hapludolls	Mollisols.
--	Cumulic Hapludolls	Mollisols.
l,	Cumulic Hapludolls	Mollisols.
--	Fluventic Haplaquolls	Mollisols.
l,	Typic Argiaquolls	Mollisols.
--	Aeric Fluventic Haplaquepts	Inceptisols.
--	Aeric Ochraqualfs	Alfisols.
--	Typic Argiaquolls	Mollisols.
--	Aeric Ochraqualfs	Alfisols.

acement in the families, may change as more precise infor-

this difference does not alter their usefulness and behavior.

al Nature of the County

s section additional information is given about County. The climate; physiography, relief and ; water supply; and farming of the area are iscussed.

County was organized in 1821, 7 years after was admitted to statehood. Early settlers in the reas and river bottoms found the county covered at forests of oak, poplar, and walnut. First the ttoms were cleared. As the county grew and be- re urban, the swampy flat uplands were cleared. ncreased in size but were operated by fewer peo- e and more people were commuting to such cities napolis. By 1960 the population of the county was

yville, the county seat, is the industrial center of County. It has numerous small and large manu- g plants and several small industries. The good tation facilities and closeness to Indianapolis e county a desirable location for small industries.

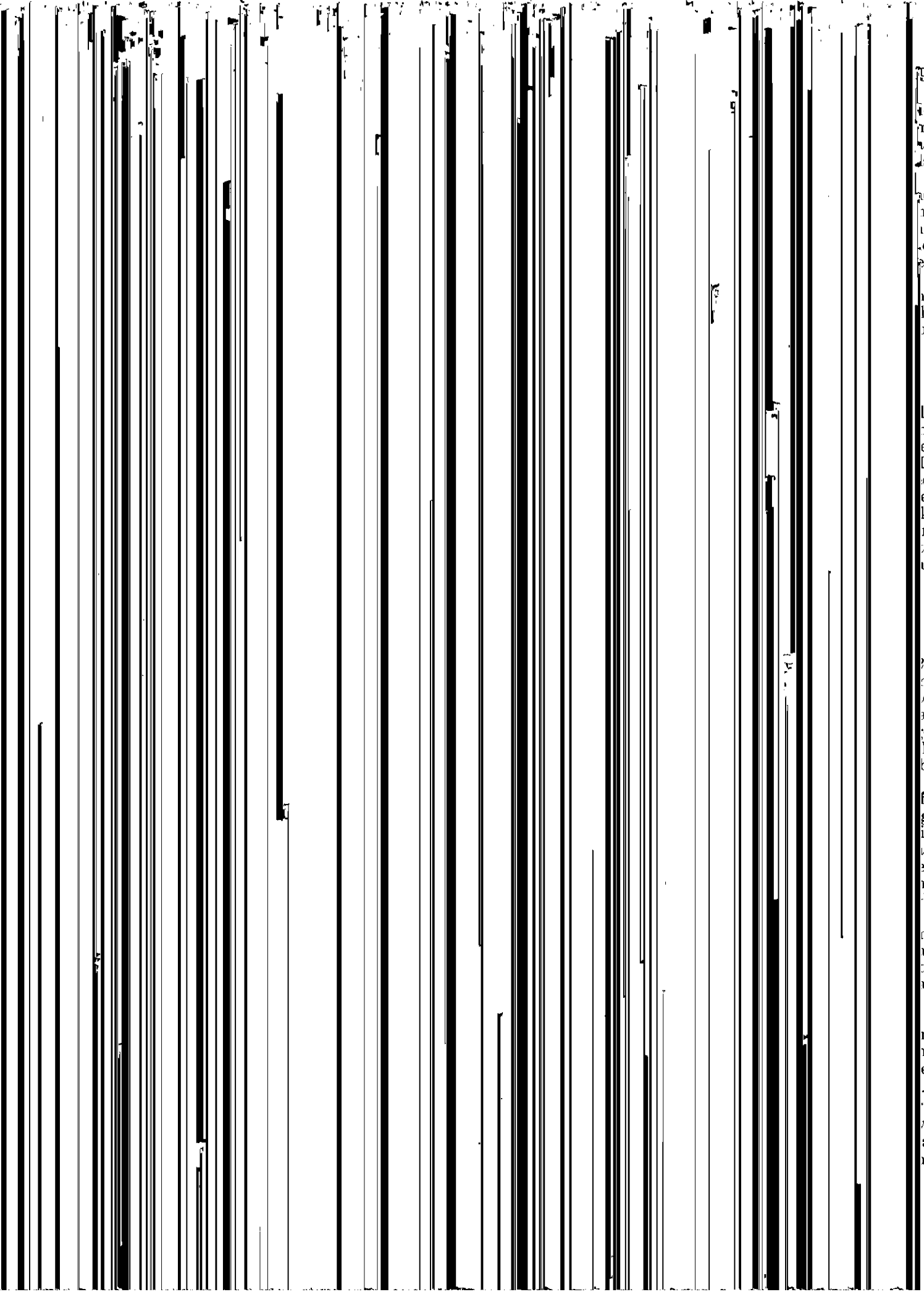

TABLE 9.—*Temperature and precipitation data*

[All data from Shelbyville, Shelby County, Indiana]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Average monthly maximum	Average monthly minimum	Average monthly total	1 year in 10 will have—		Days with snow cover of 1 inch or more	Average depth of snow on days with snow cover of 1 inch or more
						Less than—	More than—		
	°F.	°F.	°F.	°F.	Inches	Inches	Inches	Number	Inches
January	40	23	61	−1	3.1	0.8	8.0	4	2
February	43	25	63	3	2.5	.6	4.6	3	3
March	52	32	74	13	3.7	1.4	7.7	1	2
April	64	42	83	26	3.9	1.4	7.1	0	0
May	75	52	89	36	4.2	1.5	7.7	0	0
June	85	62	95	46	3.9	1.1	7.0	0	0
July	88	64	97	52	3.8	1.1	6.3	0	0
August	87	63	96	49	3.3	1.7	5.8	0	0
September	80	55	93	38	3.5	.9	7.0	0	0
October	69	45	85	28	2.3	.5	4.5	0	0
November	52	33	73	15	3.2	1.3	6.4	(1)	2
December	41	25	62	3	2.7	.8	5.1	5	3
Year	65	47	[2] 99	[3] −6	40.1	30.7	50.4	13	2

[1] Less than one-half day.
[2] Average annual maximum.
[3] Average annual minimum.

TABLE 10.—*Probabilities of last freezing temperatures in spring and first in fall*

[All data from Shelbyville, Shelby County, Indiana]

Probability	Date for given probability and temperature				
	16° F. or lower	20° F. or lower	24° F. or lower	28° F. or lower	32° F. or lower
Spring:					
1 year in 10 later than	March 26	April 2	April 14	April 26	May 14
2 years in 10 later than	March 19	March 27	April 8	April 20	May 8
5 years in 10 later than	March 4	March 14	March 26	April 8	April 26
Fall:					
1 year in 10 earlier than	November 11	November 6	October 27	October 11	September 30
2 years in 10 earlier than	November 19	November 12	October 31	October 16	October 6
5 years in 10 earlier than	December 5	November 24	November 10	October 28	October 18

Flatrock River. Sugar Creek drains the western part of the county, and Flatrock River drains the southeastern and south-central part. Flatrock River has two major tributaries, Conns Creek and Lewis Creek.

Farming

Shelby County is one of the important farming counties in Indiana. Farming is generally of the cash-grain and livestock type. The following statistics are from the census of agriculture.

In 1964 there were 233,040 acres, or 89 percent, of the land in farms, a decrease from 234,689 acres, or 89.7 percent, in 1959. In 1964 there were 1,298 farms, a decrease from 1,586 farms in 1959. The size of the farms is increasing, from an average of 148.0 acres in 1959 to 179.5 acres in 1964. The average value per acre increased from $342.73 in 1959 to $413.52 in 1964.

The types of farms are changing somewhat. In 1959 there were 410 miscellaneous and unclassified farms, and in 1964 there were 294. During that period, the number of general farms decreased from 110 to 52. The average number of livestock farms, other than poultry and dairy, was 541 in 1959 and 284 in 1964. Dairy farms numbered 160 in 1959 and 123 in 1964. Cash-grain farms showed an increase in number from 410 in 1959 to 530 in 1964.

n more acres than any other crop, but also extensive. In 1964, 71,423 acres of d for grain and 45,352 acres were in ain was grown on 27,823 acres.

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ENE FORMATIONS IN INDIANA. Ind. Geol. Bul. 25, 85 pp., illus.

fine particles held in a single mass or cluster.
egates, such as crumbs, blocks, or prisms, are are aggregates produced by tillage or logging.
al, such as sand, silt, or clay, that has been l by streams.
oil that contains enough calcium carbonate esium carbonate) to effervesce (fizz) visibly h cold, dilute hydrochloric acid.
r "chain," of soils on a landscape, that devel- ind of parent material but have different cause of differences in relief and drainage.
te, the mineral soil particles less than 0.002 meter. As a soil textural class, soil material or more clay, less than 45 percent sand, and ent silt.
feel of the soil and the ease with which a hed by the fingers. Terms commonly used to ice are—
t when dry or moist; does not hold together

ist, crushes easily under gentle pressure be- nd forefinger and can be pressed together

, crushes under moderate pressure between finger, but resistance is distinctly noticeable.
, readily deformed by moderate pressure but into a lump; will form a "wire" if rolled and forefinger.
, adheres to other material and tends to at and pull apart, rather than to pull free terial.
moderately resistant to pressure; can be ficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard and brittle; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour or are parallel to terraces or diversions. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Cover crop. A close-growing crop grown primarily to improve and to protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect downslope areas from the effects of such runoff.

Drainage, natural. Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.
Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.
Well-drained soils are nearly free from mottling and are commonly of intermediate texture.
Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.
Somewhat poorly drained soils are wet for significant periods but not all the time, and in podzolic soils commonly have mottlings below a depth of 6 to 16 inches, in the lower A horizon and in the B and C horizons.
Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be lacking or nearly so in some soils.
Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Drift (geology). Material of any sort deposited by geologic processes in one place after having been removed from another; includes drift materials deposited by glaciers and by streams and lakes associated with them.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Fertility, soil. The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when such other growth factors as light, moisture, temperature, and the physical condition of the soil are favorable.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.
A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active, and, therefore, it is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).
B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.
C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

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